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TEXTBOOK OF GYNÆCOLOGY

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By

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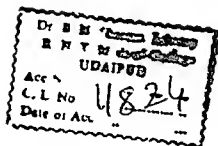
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PREFACE TO THE FOURTH EDITION

IN the preparation of the present edition the text has been carefully revised and some of it has been rewritten. As in the last edition, new work on Endocrinology and Chemotherapy has been included and the chapter on Diseases of the Ovaries has been brought up to date. Some sixteen new diagrams have been introduced which has slightly increased the size of the book.

The textbook was written originally with the intention of presenting the subject as scientifically and logically as I was able. Although it may not be obvious, the same style was used for both clinical and theoretical work. The book has now reached its fourth edition since it was first published in 1930, and both the second and third editions were reprinted. The demand for the work has therefore confirmed my belief that the subject could be dealt with in this way.

My thanks are due to Dr. Beryl Henckley, who has collaborated with enthusiasm in preparing the present edition. She helped to select the new illustrations—not a simple task by any means—and has drawn them with great skill. She has also corrected the proofs and has been responsible for revising and elaborating the index.

WILFRED SHAW.

PREFACE TO THE FIRST EDITION

THIS book is intended for the use of students presenting themselves for qualifying examinations, and it may also be of service to practitioners. Attention has been paid in the text to the clinical side of gynecology, and detailed pathological descriptions have been avoided so far as possible. More stress has been placed upon anatomy and physiology than has been the practice in most recent textbooks of gynecology, because it is believed that future advances are most likely to emanate from these sources.

A textbook of this kind cannot be written without frequent reference to the standard works. I wish to acknowledge the help I have received from Eden and Lockyer's "Gynecology," particularly Beckwith Whitehouse's admirable edition, to Eden and Lockyer's "System of Gynecology," to Jeff Miller's "Clinical Gynecology," and most especially to Stoeckel's "Lehrbuch der Gynäkologie." The Veit Stoeckel and the Halban-Seitz Handbuchs have been used for reference to the rarer gynecological conditions.

I have to thank the publishers, S. Karger, of Berlin, for the loan of the original drawings used for the Peham-Amreich "Operative Gynecology," and Messrs. Bergman, of Munich, for the loan of the original drawings used in the Veit-Stoeckel Handbuch. New blocks have been made and acknowledgment has been made in the text. I want particularly to thank my old friend Dozent Dr. Amreich for his help in obtaining the loan of the drawings. My acknowledgments are due to Dr. T. Watts Eden for permission to make use of illustrations from

Eden's "Midwifery." Professor Beckwith Whitehouse has very kindly allowed me to use the blocks of the illustrations taken from Eden and Lockyer's "Gynæcology," and Drs. Jellett and Tottenham have permitted me to make use of diagrams from their "Short Practice of Gynæcology."

I must also thank Mr. R. T. Payne, one of the curators of the Museum at St. Bartholomew's Hospital, for permission to photograph specimens, and Messrs. Allen and Hanburys for the loan of the blocks of the illustrations of the instruments.

My thanks are also due to Messrs. J. & A. Churchill Ltd. for their courtesy in the preparation of this book.

WILFRED SHAW.

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GYNÆCOLOGY

CHAPTER I

ANATOMY

VULVA

THE vulva is formed by the two pairs of labio and by the clitoris. The labia majora pass from the mons veneris to end posteriorly in the skin of the perineal body. They consist of folds of skin which enclose a variable amount of fat. The labia majora are best developed in the child-bearing period of life. In children before the age of puberty, and in post-menopausal women the amount of subcutaneous fat in the labia majora is relatively small and the cleft between the labio is conspicuous. At puberty the pudendal hair appears on the mons veneris, on the outer surface of the labia majora and in some cases on the skin of the perineum as well. The inner surfaces of the labia majora are hairless and the skin of this situation is softer, moister and pinker than over the outer surfaces.

Bartholin's gland lies in the substance of the labium majus and its duct passes forwards and inwards to open, external to the hymen, on the inner side of the labium minus. The gland measures about $\frac{1}{2}$ in in diameter and lies near the junction of the middle and posterior thirds of the labium majus. It cannot be palpated except when it is inflamed. The duct of the gland is about $\frac{1}{2}$ in long and a thin mucous secretion can be expressed from it by pressure upon the gland. Bartholin's gland and its duct are infected in acute gonorrhœa. In such cases the reddened mouth of the duct can easily be distinguished on the inner surface of the labium minus to one side of the vaginal orifice. Bartholin's gland belongs to the compound racemose type and the acini are lined by low columnar epithelium. The epithelium of the duct is cubical near the acini, but becomes transitional and finally squamous near the mouth of the duct. The function of the gland is to secrete a lubricating mucus.

during coitus. The labia majora join at the posterior commissure to limit the vulva posteriorly.

The labia minora lie on the inner aspect of the labia majora. Anteriorly they enclose the clitoris to form the prepuce on the dorsum and the frenulum on the under surface, posteriorly they join to form the fourchette. The fourchette is a thin fold of skin, identified when the labia are separated, which is often

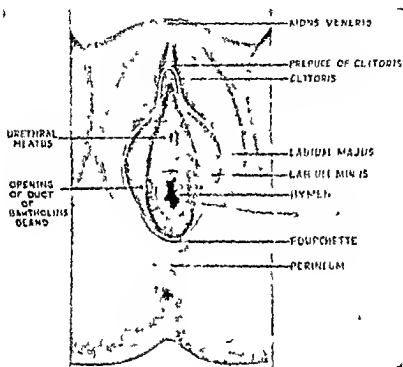


FIG. 1. Anatomy of vulva.

torn during parturition. The fossa navicularis is the small hollow between the hymen and the fourchette. The labia minora are thin folds of skin which enclose veins and elastic tissue. They are hairless, but numerous sebaceous glands develop in them at puberty and persist throughout the child-bearing period of life. The clitoris corresponds to the penis and is attached to the under surface of the symphysis pubis by the suspensory ligament. Crura cavernosa attach the clitoris to the inferior margin of the pubic ramus. The clitoris is well supplied

with nerve endings and is extremely sensitive. During coitus it becomes erect and plays a considerable part in inducing the orgasm of the female. The vestibule is the space lying between the labia minora and is bounded posteriorly by the fourchette. The external urinary meatus lies immediately posterior to the clitoris. Its shape varies from a circular opening to a slit with lateral lips. The vaginal orifice or introitus vaginae lies posterior to the meatus and is surrounded by the hymen. In virgins the hymen is represented by a thin membrane covered on each surface by squamous epithelium, and has a small eccentric



FIG. 2 The normal hymen

opening which is not wide enough to admit the tip of the finger. Coitus results in rupture of the hymen and the coitus lacerations are radially arranged and are multiple. During child birth further lacerations occur. The hymen is widely stretched and subsequently is represented by the tags of skin known as the carunculæ myrtiformes. The hymen varies considerably in shape even in virgins and hymen annularis, cribriformis, falciformis, and imperforatus are all known. Furthermore hymen rigidus may prevent penetration of the penis in attempted coitus, while on the other hand even in virgins the hymen may be sufficiently patulous to admit two fingers.

VAGINA

The lower end of the vagina lies at the level of the hymen and of the introitus vaginae. It is surrounded at this point by the erectile tissue of the bulb which corresponds to the bulbos urethrae of the male. The direction of the vagina is approximately parallel to the plane of the brim of the true pelvis: the vagina is slightly concave from above downwards and its anterior and posterior walls lie in close contact. The vaginal portion of the cervix projects into its upper end and leads to the formation of the anterior, posterior and lateral fornices. The depth of the fornices depends upon the development of the portio vaginalis of the cervix: in elderly women in whom the uterus has undergone post-menopausal atrophy the fornices are shallow, while in cases of congenital vaginal elongation of the cervix, the fornices are particularly well marked. The vagina is attached to the cervix at a higher level posteriorly than elsewhere and this leads to the posterior fornix being the deepest of the fornices and to the posterior vaginal wall being longer than the anterior. The posterior vaginal wall measures $4\frac{1}{2}$ in. long, the anterior $3\frac{1}{2}$ in. In virgins the vaginal wall is thrown into transverse folds which pass laterally from anterior and posterior median ridges. These folds are best developed in the lower third: they are stretched during child-birth and become inconspicuous in women who have borne many children. The vagina is lined by squamous epithelium which consists of a basal layer of cubical cells, a middle cell layer of prickle cells and a superficial layer of horny cells. The epithelium is much more delicate than that of the skin and is softer and pinker. In the new born the epithelium is almost transitional in type and horny cells are scanty until puberty is reached. No glands open into the vagina, and the vaginal secretion is derived partly from the mucous discharge of the cervix and partly from a transudation from the vaginal epithelium. The subepithelial layer is vascular and contains much erectile tissue. A muscle layer consisting of an inner circular and an outer longitudinal layer of plain muscle lies external to the subepithelial layer, while the larger vessels lie in the connective tissues surrounding the vagina. The vaginal secretion is small in amount in healthy women, and consists of white coagulated material. When it is examined under the microscope, squamous cells which have been shed from the vaginal epithelium and Döderlein's bacilli

alone are found Doderlein's bacillus is a large Gram positive organism which grows anaerobically on acid media It appears in the vagina during the 1st week of extra uterine life. The method of examining the vaginal secretion by staining films allows the contents of the vagina to be graded in degrees of "purity," and the technique is useful for identifying different forms of vaginal discharge. The vaginal secretion is acid from the presence of lactic acid and this acidity inhibits the growth of pathogenic organisms. The origin of the lactic acid found in the vagina is not known with certainty. Doderlein suggested that it was produced by the fermentation of the mucin of the



FIG 3 Vaginal wall showing the squamous epithelium while below are bundles of plain muscle cells. The squamous epithelium is corrugated

cervical secretion by Doderlein's bacillus, for mucin is a glyco protein with a carbohydrate radical, but the modern tendency is to attribute the production of the lactic acid to the squamous cells of the vagina, for it has recently been shown that these cells contain glycogen and there is reason to believe that transudation through the vaginal epithelium is responsible for part at least of the vaginal secretion. During the puerperium and also in cases of leucorrhœa the acidity of the vagina is reduced and pathogenic organisms are then able to survive in this environment. The squamous cells of the vagina stain a deep brown colour after being painted with iodine. This reaction is not given if the cells become malignant.

THE UTERUS

The uterus is pyriform in shape and measures approximately 3 in. in length, 2 in. in width and 1 in. in thickness. It is divided anatomically and functionally into a body and cervix. The line of division corresponds to the level of the internal os and here the mucous membrane of the body becomes continuous with that of the cervical canal. At this level the peritoneum of the front of the uterus is reflected on to the

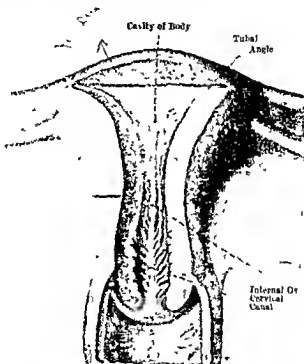


FIG. 4. A nulliparous uterus opened from behind (Vest-Stoeckel.)

bladder, and the uterine artery, after passing almost transversely across the pelvis, reaches the uterus, turns at right angles to its original course and passes vertically upward along the lateral wall of the uterus. The cervix is divided into vaginal and supra-vaginal portions. The vaginal portion of the cervix projects into the vagina and in virgins is conical in shape; in multiparae it is shorter and squatter. The fundus of the uterus is that part of the corpus uteri which lies above the insertion of the Fallopian tubes. The cavity of the uterus

is constricted at the level of the internal os where it passes into the cervical canal. Above, the cavity of the uterus communicates with the openings of the Fallopian tubes, and by way of the Fallopian tubes and their abdominal ostia is in direct continuity with the peritoneal cavity. The cervical canal extends from the internal os above, to the external os below where it opens into the vagina; it is spindle shaped, for both ostia are narrower than the rest of the canal. The mucous membrane of the body of the uterus is smooth and glistening except during menstruation when it becomes dull and finely irregular. The mucous membrane of the cervical canal, like that of the lower part of the vagina, is thrown into folds, and oblique furrows pass away from anterior and posterior vertical ridges (arbor vitæ).

The wall of the uterus consists of three layers, the peritoneal covering or perimetrium, the muscle layer or myometrium and the mucous membrane or endometrium.

Perimetrium

The peritoneal covering of the uterus is incomplete. Anteriorly the whole of the body of the uterus is covered with peritoneum. The peritoneum is reflected on to the bladder at the level of the internal os, which indicates the junction of the body with the cervix of the uterus. The cervix of the uterus has therefore no peritoneal covering anteriorly. Posteriorly the whole of the body of the uterus is covered by peritoneum, as is the supra-vaginal portion of the cervix. The peritoneum is reflected from the supra-vaginal portion of the cervix on to the posterior vaginal wall in the region of the posterior fornix. The peritoneal layer is incomplete laterally because of the insertion of the Fallopian tubes, the round and ovarian ligaments into the uterus, and below this level the two sheets of peritoneum which constitute the broad ligament leave a thin bare area on each side. Very little peritoneum covers the cervix while most of the body of the uterus has a peritoneal layer.

Myometrium

The myometrium is the thickest of the three layers of the wall of the uterus. In the cervix the myometrium consists of

plain muscle tissue together with a large amount of fibrous tissue which gives it a hard consistence. The muscle fibres and fibrous tissue are mixed together without orderly arrangement. In the body of the uterus the myometrium measures about $\frac{1}{2}$ inch in thickness, and three layers can be distinguished which are best marked in the pregnant or puerperal uterus. The external layer lies immediately beneath the peritoneum and is longitudinal, the fibres passing from the cervix anteriorly over the fundus to reach the posterior surface of the cervix. This layer is thin and cannot easily be identified in the nulliparous uterus. The middle layer is the thickest of the three and consists of plain muscle and connective tissue. The relative proportion of plain muscle to connective tissue varies with age: plain muscle tissue is best marked in the child-bearing period, especially during pregnancy, while before puberty and after the menopause it is much less plentiful. The muscle tissue of the middle layer of the myometrium is arranged in bundles which are separated by connective tissue. There is a tendency for the muscle bundles to interlace, and, as the blood vessels which supply the uterus are distributed in the connective tissues, the calibre of the vessels is in part controlled by the contraction of the muscle cells. The inner muscle layer consists of circular fibres. The layer is never well marked and is best represented by the circular muscle fibres around the internal os and the openings of the Fallopian tubes.

Endometrium

The endometrium of the body of the uterus has a different structure from that of the cervix. In the body of the uterus it measures about 8 to 4 mm. in thickness and consists of a surface epithelium, glands and stroma. The endometrium of the body varies in its structure and in its thickness during the menstrual cycle, becoming hypertrophied in the premenstrual phase and showing necrosis of the superficial layers during menstruation. In pregnancy it hypertrophies much more and forms the decidua of the uterus. The cells of the surface epithelium are cubical or low columnar in shape, with centrally placed nucleus and faintly granular protoplasm. They are ciliated and the direction of ciliary movement is downwards towards the internal os. The surface epithelium is sometimes high columnar in cases of myomata and uterine hyperplasia. The glands of the endome-

trium of the body are simple tubules during the post-menstrual phase of the cycle but become hypertrophied as menstruation approaches, changing from simple tubules to sinuous and finally corkscrew-shaped glands. The glandular epithelium resembles the surface epithelium but is subject to great variation during the menstrual cycle. The stroma intervenes between the surface epithelium and the myometrium; it is richly cellular and consists of spindle-shaped cells, blood vessels and lymphatics. A few small lymphatic nodes are scattered over the basal part

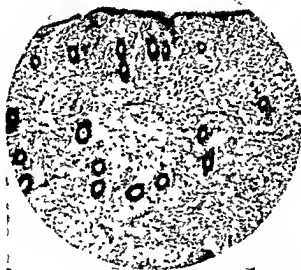


FIG 5. Normal endometrium during the proliferative phase. The glands are simple tubules. The stroma is oedematous while the small dark cells beneath the surface epithelium are extravasated red blood corpuscles

of the endometrium in the vicinity of which lymphocytes can be distinguished amongst the spindle cells of the stroma. Similar nodes are found in the endometrium of the uterus of primates. Normally the endometrium is sharply demarcated from the underlying myometrium, but in the pathological condition of adenomyosis interna, both stroma and glandular tissue from the endometrium invade the myometrium. The endometrium possesses remarkable powers of rapid regeneration, for repair is complete within three weeks of parturition and within a few days of menstruation.

The endometrium of the cervix differs fundamentally from that of the body of the uterus by the absence of a submucosa. The

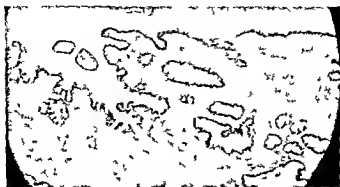


FIG 6 Normal cervical canal. Above lies the cavity of the cervical canal. The epithelium is high columnar. Mucous glands open into the cervical canal.

epithelium of the cervical canal and of its glands comes directly into contact with the myometrium of the cervix. The glands



FIG 7 The glands of a normal cervix. The glands are complex and are lined by high columnar epithelium which secretes mucus.

of the cervix are acinar in type, and much more complex than those of the body. They secrete mucus which collects as a plug in the cervical canal and hinders ascending infections. In

gonococcal infections of the cervix the organisms collect amongst the intricate crypts of the cervical glands where they evade the action of antiseptics applied to the cervical canal. The epithelium of the cervical glands and of the cervical canal is high columnar in type with spindle-shaped nucleus lying adjacent to the basement membrane. The cells of the cervical canal are ciliated, and, again, the direction of ciliary movement is downwards towards the external os. The basement membrane of the epithelium of the cervical glands and cervical canal lies

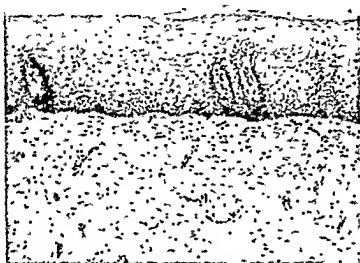


FIG. 8. Normal cervix showing the squamous epithelium of the portio vaginalis. The squamous epithelium rests upon a basal layer of cubical cells. Above this is a layer of prickle cells, while superficially lie horny cells. The stroma consists mainly of connective tissue.

in contact with the myometrium of the cervix and there is no intervening stroma.

The vaginal portion of the cervix is covered by squamous epithelium which becomes continuous with the columnar cells of the cervical canal at the external os. The squamous epithelium is similar to that of the vagina and is more delicate than that of the skin. It consists of a basal layer one cell thick of cubical cells, a middle layer of prickle cells, and a superficial layer of horny cells. The surface of the portio vaginalis of the cervix is normally salmon pink in colour, but it is not uncommon for the columnar epithelium of the cervical canal to replace the

squamous epithelium in the vicinity of the external os to produce the condition of erosion of the cervix. Because of the translucency of the columnar cells these erosion areas appear bright red in colour in marked contrast to the normal salmon pink tint of the squamous covering of the portio.

In virgins the vaginal portion of the cervix is conical with a small aperture, the external os, at the apex of the cone. A few circular muscle fibres surround the external os. During labour these fibres are split laterally on each side, the tear being most marked on the left. As a result of this tearing of the circular muscle fibres, the anterior and posterior lips of the cervix become differentiated. They cannot be distinguished in the nulliparous cervix.

Structurally and functionally the body and cervix of the uterus are in marked contrast. The cervical endometrium shows no periodic alteration during the menstrual cycle, and decidual reaction of pregnancy is seen only rarely in the cervix. Similarly, in malignant disease of the uterus, there are well marked differences. Carcinoma of the body of the uterus is an adenocarcinoma of relatively low malignancy, while carcinoma of the cervix is usually a squamous celled growth of high malignancy.

Although it is convenient for descriptive purposes to divide the uterus into body and cervix, the line of division is not so clear cut as the above descriptions suggest. It was pointed out by Aschoff, and subsequently confirmed by his pupils, that an intermediate zone, the isthmus uteri, lies between the endometrium of the body and the mucous membrane of the cervical canal. This area is limited above by the internal os and its endometrium resembles that of the body more than that of the cervical canal, not only structurally but because it displays changes during the menstrual cycle and undergoes decidual reaction during pregnancy. This histological differentiation of the cervical canal may have some bearing on the line of demarcation between the upper and lower uterine segments during labour. One of the usual features of the isthmus uteri is that its glands frequently show cystic dilatation which may be visible to the naked eye. Such cystic glands are known as Naboth's follicles or ovula Nabothi. The follicles are also found in the cervical canal and in the condition follicular erosion of the cervix they can be seen beneath the epithelium of the vaginal portion of the cervix in the vicinity of the external os.

THE UTERINE APPENDAGES

The uterus projects upwards from the situation of the pelvic floor into the peritoneal cavity and carries on each side of it two folds of peritoneum which pass laterally to the pelvic wall and form the broad ligaments. The Fallopian tubes pass outwards from the uterine cornua and lie in the upper border of the broad ligaments. The ovarian ligaments posteriorly, and the round ligaments anteriorly, also pass into the uterine cornua but at a slightly lower level than the Fallopian tubes. Both these ligaments and the Fallopian tubes are extraperitoneal.

The round ligaments pass from the uterine cornua beneath the anterior peritoneal folds of the broad ligaments to reach the internal abdominal rings. In this part of their course they are curved and, lying immediately beneath the peritoneum, are easily distinguished. The round ligaments pass down the inguinal canals and finally end by becoming adherent to the skin of the labia majora. The ligaments consist of plain muscle and connective tissue and vary considerably in thickness. They hypertrophy during pregnancy, and by contracting during labour pull down the fundus of the uterus and help to expel the foetus. The round ligaments are much better developed in multiparae than in virgins. They correspond developmentally to the gubernaculum testis and are morphologically continuous with the ovarian ligaments, for during intra uterine life the ovarian and round ligaments are continuous and connect the lower pole of the primitive ovary to the inguinal canal. The round ligaments are lax, and, except during labour, are free of tension. There is no evidence that the normal position of ante flexion and anteversion of the uterus is produced by contraction of the rounded ligaments. On the other hand, the ligaments may be shortened by operation or they may be attached to the anterior abdominal wall both procedures being used to cause ante flexion in a uterus which is pathologically retroflexed.

The ovarian ligaments pass upwards and inwards from the inner poles of the ovaries to reach the cornua of the uterus below the level of the attachment of the Fallopian tubes. They lie extraperitoneally beneath the posterior peritoneal fold of the broad ligament and measure about an inch in length. Like the round ligaments they consist of plain muscle fibres and con

nective tissue, but they are not so prominent for they contain less plain muscle tissue

The Fallopian Tubes Each Fallopian tube is attached to the uterine cornu and passes outwards and backwards in the upper part of the broad ligament. The Fallopian tube measures about 5 in in length and approximately one third of an inch in diameter, but the diameter diminishes near the cornu of the uterus. The Fallopian tube is divided anatomically into four parts: the interstitial portion passes through the wall of the uterus, the isthmus represents the constricted inner third, the ampulla

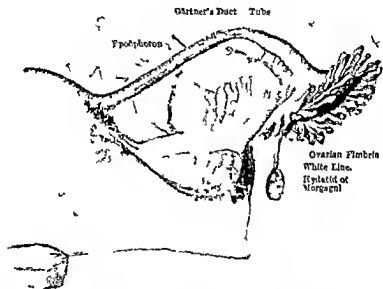


FIG 9 The uterine adnexa of the right side (Van Stoeckel)

forms the outer two thirds of the tube and is the longest and widest portion, and lastly the fimbriated extremity. The ovarian fimbria is longer and more conspicuous than the other fimbriae and extends towards the situation of the ovary. The widest portion of the Fallopian tube is the ampulla, the narrowest is the pars interstitialis with a lumen of not more than 1 mm. The Fallopian tube represents the cranial end of the Mullerian duct and its lumen is continuous with the cavity of the uterus. Consequently spermatozoa and the fertilised ovum can pass along the tube and fluids such as lipiodol and gases such as air and oxygen may be injected through the uterus and by way of the Fallopian tubes into the peritoneal cavity. By

these means the patency of the Fallopian tubes can be investigated clinically. The Fallopian tubes lie in the upper part of the broad ligaments and are covered with peritoneum except along a thin area inferiorly, which is left bare by the reflection of the peritoneum to form the two layers of the broad ligament. The blood supply of the Fallopian tube is mainly derived from the tubal branches of the ovarian artery, but the anastomosing branch of the uterine artery supplies its inner part. Unlike the vermiform appendix the Fallopian tube does not become gangrenous when acutely inflamed, for it has two sources of blood which reach it at opposite ends. The lymphatics of the Fallopian tube communicate with the lymphatics of the fundus of the uterus and with those of the ovary.

The Fallopian tubes have three layers serous, muscular and mucous. The serous layer consists of the mesothelium of the peritoneum. Intervening between the mesothelium and the muscle layer is a well defined subserous layer in which numerous small blood vessels and lymphatics can be demonstrated. The muscle layer consists of outer longitudinal and inner circular fibres. The circular fibres are best developed in the isthmus portion and are thinned out near the fimbriated extremity. The mucous membrane is thrown into folds or plicæ. Near the isthmus three folds can be recognised, but when traced laterally they divide and subdivide so that in the ampullary region they become highly complex. Each plica consists of a stroma which is covered by epithelium. The stroma is cellular and its cells are in some ways similar to those of the endometrium. The blood vessels of the stroma are plentiful and are particularly well marked in the ampullary region. The epithelium of the mucous membrane consists of several types of cell. The commonest is ciliated, and is either columnar or cubical in type. Next in order of frequency is a goblet shaped cell, not ciliated, which does not give the microchemical reactions for mucin. A cell intermediate in type to the two already mentioned can be distinguished and small rod shaped cells are also present. It has been possible to demonstrate differences in the histological appearances of the epithelium of the Fallopian tubes during the menstrual cycle.

THE PELVIC MUSCULATURE

The pelvic muscles which are of importance in gynaecology are those of the pelvic floor. These muscles are grouped into three

layers (a) those of the pelvic diaphragm, (b) those of the urogenital diaphragm, and (c) the superficial muscles of the pelvic floor

The pelvic diaphragm consists of the two levator ani muscles. Each levator ani muscle consists of three main divisions, the

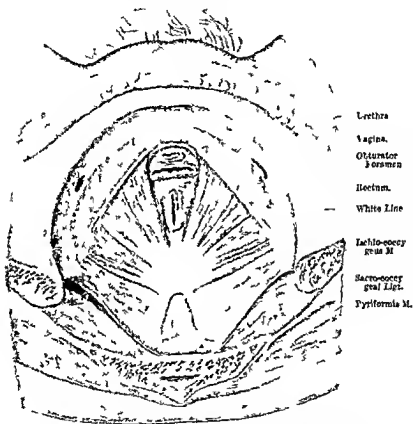


FIG. 10. The muscular pelvic floor seen from above after the removal of the pelvic viscera and pelvic fascia. (Pelham Amreich.)

pubo coccygeus, the ilio-coccygeus and the ischio coccygeus. The pubo-coccygeus muscle arises from the posterior surface of the body of the pubic bone and passes backwards, lateral to the vagina and rectum to be inserted into the ano coccygeal raphe and into the coccyx. The inner fibres which come together posterior to the rectum are known as the pubo-rectalis portion of the muscle. They sling up and support the rectum. Some of the

inner fibres of the pubo rectalis fuse with the outer wall of the vagina as they pass lateral to it. Other fibres decussate between the vagina and rectum in the situation of the perineal body. These decussating fibres divide the space between the two levator ani muscles into an anterior portion, the hiatus urogenitalis, through which passes the urethra and vagina and a posterior portion, the hiatus rectalis, through which passes the rectum. The dimensions of the hiatus urogenitalis depend upon two main factors—the tone of the levator muscles and the existence of the decussating fibres of the pubo rectalis muscle. Perineal tears occurring during parturition may divide these decussating fibres, when the hiatus urogenitalis becomes patulous and leads to a tendency to prolapse. In visceroptosis and asthenic states the levator muscles become lax, the dimensions of the hiatus urogenitalis are increased and again there is a tendency for the pelvic viscera to prolapse. In virgins the hiatus urogenitalis is small and its maximum width is less than the width of the uterus. The ilio-coccygeus is a fan shaped muscle arising from a broad origin along the white line of the pelvic fascia and passing backwards and inwards to be inserted into the coccyx. The ischio-coccygeus or coccygeus muscle has a narrow origin from the ischial spine and spreads out posteriorly to become inserted into the front of the coccyx.

The levator muscles together constitute the pelvic diaphragm and support the pelvic viscera. Furthermore, contraction of the levator muscle pulls the rectum and vagina towards the symphysis pubis, the rectum is thereby kinked and closed and the vagina narrowed antero posteriorly so that its anterior and vaginal walls come into contact. The origin of the levator muscle is fixed because the muscle arises anteriorly either from bone or from fascia which is attached to bone. Posteriorly the insertion is either into the ano-coccygeal raphe or into the coccyx and both these attachments are movable. It follows that contraction of the levator muscles leads to these posterior attachments being pulled towards the symphysis pubis. The movement of internal rotation of the presenting part during parturition is controlled by this property of the levator muscles. Uterine contractions push the presenting part down upon the levator ani and cause the muscle to contract as a result of the direct pressure of the presenting part. The lowest part of the foetus is carried forwards during the contraction of the levator muscles and as the anterior fibres of the muscle are directed

inwards as well as forwards the presenting part becomes rotated forwards and inwards.

The superior and inferior surfaces of the levator muscles are covered by the pelvic fascia which separates the muscles from the cellular tissue of the parametrium above and from the fibrous and fatty tissue of the ischio-rectal fossa below.

The urogenital diaphragm is not so well developed in the female as in the male. It extends from the pubic arch anteriorly

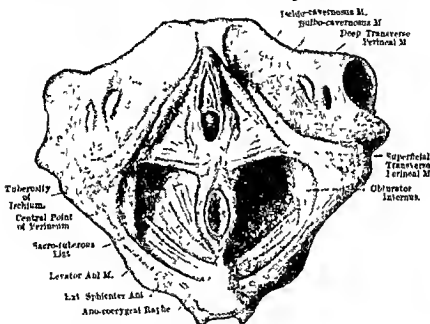


FIG. 11. The perineal muscles from below (Vest Stoeckel)

to the central point of the perineum posteriorly and consists of two layers of fascia through which pass the vagina and urethra. The central point of the female perineum lies between the vagina and the rectum. Within the two fascial layers of the urogenital diaphragm lies the deep transverse perineal muscle which extends laterally on each side to reach the ramus of the pubic bone.

The Superficial Muscles. Four muscles are identified in this layer. The external sphincter muscle of the anus is attached anteriorly to the central point of the perineum and surrounds the anus. The bulbos cavernosus muscle or, as it is sometimes called, the sphincter vaginae, extends from the central point of

the perineum on each side of the vagina to be attached anteriorly to the symphysis pubis. It lies around and lateral to the urethral bulb. The ischio-cavernosus muscle extends on each side from the ischial tuberosity in relation to the crus of the clitoris to reach the clitoris in the middle. The superficial transverse muscle of the perineum passes laterally on each side from the central point of the perineum to the pubic ramus. It is small compared with the deep transverse muscle of the perineum.

The perineal body intervenes between the posterior vaginal wall and the anal canal. It is pyramidal in shape with its apex on a level with the junction of the middle and lower third of the posterior vaginal wall. The three layers of muscles of the pelvic floor are represented in the perineal body, and the intervening tissue consists of fat and fibrous tissue. Superficially, passing from the central point of the perineum, are the external sphincter of the anus, the bulbo cavernosus and the superficial transverse muscle of the perineum. Deep to this layer lie the fascial layers of the urogenital diaphragm enclosing the deep transverse muscle of the perineum. Deeper still the pelvic diaphragm is represented by the fibres of the levator ani muscles which decussate between the vagina and rectum. Tears of the perineal body arise during parturition, and lacerations of the decussating fibres of the levator ani muscle widen the hiatus urogenitalis and produce a tendency to subsequent prolapse. The perineal body is examined by inspection and by palpation. Two fingers are placed in the vagina and flexed posteriorly, the thumb being applied externally over the perineal body. In this way the amount of muscle tissue in the perineal body can be determined and the technique affords a convenient method of estimating the tone of the levator muscles. If the fingers are placed in the vagina and flexed laterally, the thumb being applied externally over the *labium majus*, the levator muscles can be palpated with remarkable ease. In this way the tone of the levator muscles and the size of the hiatus urogenitalis can both be recognised. This method of examination demands no especial skill; all that is required is a knowledge of the anatomy of the pelvic muscles.

THE OVARIES

Each ovary measures about 1 in. in length, $\frac{3}{4}$ in. in width and $\frac{1}{2}$ in. in thickness. The ovaries are roughly almond shaped but

there is much variation both in their shape and size at different stages of the menstrual cycle. The colour is white, due to a compact tunica albuginea, and the surface is slightly corrugated. The ovaries undergo atrophy after the menopause when they become shrivelled and shrunken and the grooves and furrows on the surface become well marked. Before puberty the ovaries are small and more elongated than in the adult, but even before puberty small follicles are frequently present. The ovary is attached to the back of the broad ligament by a thin mesentery, the mesovarium. The ovary is covered by an imperfect layer of cubical cells which become continuous with the mesothelial cells of the peritoneum of the mesovarium along the white line.

The normal position of the ovary is such that its convex border is directed posteriorly, while its attachment to the mesovarium is in front. Laterally the ovary lies in the fossa below the bifurcation of the common iliac artery. The Fallopian tube passes backwards and outwards from the uterus above the level of the ovary. The ovarian fimbria stretches from the fimbriated extremity of the tube downwards and then inwards to come in contact with the ovary. Internally the ovary is attached to the cornu of the uterus by the ovarian ligament, in front it is fixed to the back of the broad ligament by the mesovarium. The ovario pelvic fold (infundibulo pelvic) is the outer border of the broad ligament and contains the ovarian vessels, nerves and lymphatics. This fold of peritoneum is brought into prominence when either the Fallopian tube or the ovary is raised out of the pelvis. It has no suspensory action. The position of the ovary is subject to some variation, depending partly upon the length of the ovarian ligament but more particularly upon the position of the uterus.

In cases of retroflexion of the uterus the ovaries are prolapsed so that they fall into the pouch of Douglas and in some cases they lie immediately behind the uterus.

When the ovary is incised a cortex and a medulla can be distinguished. The cortex is firm and fibrous while the medulla is softer and contains small vessels. Primordial follicles, Graafian follicles, corpora lutea and such structures as corpora albicantia are found in the cortex of the ovary. These structures will be described in detail in the chapter on physiology. The stroma of the cortex consists of interlacing spindle cells which are packed

closely together. The tunica albuginea lies immediately beneath the surface epithelium. It is difficult to distinguish histologically except by using Heidenhain's iron hæmatoxyline stain, when the tunica albuginea can be shown to contain relatively few nuclei. The surface epithelium consists of an incomplete layer of cubical cells. Not uncommonly a thin layer of hyaline tissue intervenes between the cells and the tunica albuginea. The surface epithelium is morphologically continuous with the mesothelial cells of the peritoneum.

The medulla contains a large number of small arterioles. Veins and lymphatics are numerous in the medulla. Structures derived from the follicle system do not develop in the medulla although it is quite common for such structures as corpora lutea when they are fully developed, to spread inwards to invade the medulla. The lymphatics in the medulla of the ovary are numerous and the channels are wide. In the cortex the lymphatics are again very numerous but here they are small. The distribution of the lymphatics of the ovary can be demonstrated very beautifully in early cases of metastatic ovarian carcinoma.

The epithelial structures found in the normal ovary are restricted to the surface epithelium and a few tubules of the epoophoron which invade the hilum of the ovary to a slight degree. No other epithelial structures are found. In consequence there is considerable difficulty in explaining the origin of the common ovarian tumours, most of which are epithelial in type.

The Epoophoron. The epoophoron or parovarium, or organ of Rosenmüller, represents the cranial end of the Wolffian body. It consists of a series of vertical tubules in the mesosalpinx and mesovarium between the Fallopian tube above and the ovary below. The tubules can usually be seen without difficulty if the mesosalpinx is stretched out and examined by transmitted light. Each tubule is surrounded by plain muscle and is lined by cubical cells.

The Paroophoron. The paroophoron represents the caudal end of the Wolffian body. It consists of a few vertical tubules in the mesosalpinx internal to the position of the ovary and internal to the tubules of the epoophoron.

The Wolffian Duct. The Wolffian duct or Gartner's duct is represented by an imperfect duct which runs parallel to the Fallopian tube in the mesosalpinx a little below the level of the

tube Internally Gartner's duct passes downwards by the side of the uterus to the level of the internal os where it passes into the tissues of the cervix It then runs forwards to reach the vaginal wall and in some cases can be distinguished as far down as the level of the hymen Gartner's duct is imperfectly developed except in the mesosalpinx part of its course It is rare for distention cysts to arise from Gartner's duct Cysts are sometimes found between the anterior vaginal wall and the urethra which are believed to arise from remains of Gartner's duct

POSITION OF THE UTERUS

The uterus lies normally in a position of anteversion and ante-flexion The body of the uterus is bent forwards on the cervix approximately at the level of the internal os and this forward inclination of the body of the uterus on the cervix constitutes ante-flexion Whether the uterus is anteverted or retroverted depends upon the direction of the axis of the cervix In ante-version, the external os is directed downwards and backwards so that on vaginal examination the examining fingers find that the lowest part of the cervix is the anterior lip When the uterus is retroverted the cervix is directed downwards and forwards and the lowest part of the cervix is either the external os or the posterior lip As a result of its normal position of ante-flexion the body of the uterus lies against the bladder The pouch of peritoneum which separates the bladder from the uterus is the utero-vesical pouch The peritoneum is reflected from the front of the uterus on to the bladder at the level of the internal os

Posteriorly a large peritoneal pouch lies between the uterus and the sigmoid colon If the uterus is pulled forwards two folds of peritoneum can be seen to pass backwards from the uterus to reach the parietal peritoneum lateral to the sigmoid These folds the utero sacral folds lie at the level of the internal os and pass both backwards and upwards The utero sacral folds should be clearly distinguished from the utero sacral ligaments The utero sacral ligaments are condensations of the pelvic cellular tissues and lie at a lower level and within the utero sacral folds The pouch of peritoneum below the level of the utero sacral folds, which is bounded in front by the peritoneum covering the upper part of the posterior vaginal wall

and posteriorly by the peritoneum covering the sigmoid, is the pouch of Douglas. The posterior fornix of the vagina is in close relation to the peritoneal cavity, for only the posterior vaginal wall and a single layer of peritoneum separate the vagina from the peritoneal cavity. Collections of pus in the pouch of Douglas can therefore be evacuated without difficulty by incising the vagina in the region of the posterior fornix. On the other hand the utero vesical pouch is approached with difficulty from the vagina, first the vagina must be incised and then the bladder separated from the front of the cervix before the utero vesical fold of peritoneum is reached

THE PELVIC CELLULAR TISSUE

The pelvic cellular tissue consists of loose areolar tissue which intervenes between the peritoneum above and the pelvic fascia below. Morphologically it is continuous with the subperitoneal connective tissue and with the loose tissue of the perinephric region. Because of the presence of spaces in the perinephric region and in the pelvis the cellular tissue is most plentiful in these situations and consequently receives more attention. The areolar tissue of which it is composed is loose, and when inflamed in the condition pelvic cellulitis may lead to the development of very large swellings. As there is a direct continuation between the perinephric and pelvic cellular tissues effusions arising in either of these situations may track to point in the other. In the pelvis, the pelvic cellular tissue is bounded above by the peritoneum and below by the fascia which covers the upper surface of the levator ani muscles. Laterally it is bounded by the pelvic wall, especially by the fascia which covers the inner surface of the obturator internus, while internally it comes into contact with the uterus and the upper part of the vagina.

The parametrium is that part of the pelvic cellular tissue which surrounds the uterus. It is by definition extraperitoneal, and is most plentiful on each side of the uterus below the level of the internal os. Above this level, the presence of the broad ligaments reduces the amount of parametrium to a minimum. It should be remembered that the level of the levator ani muscles is well below the level of the cervix, being roughly half-way down the vagina. The pelvic cellular tissue is usually very plentiful on each side of the vagina, where it is called the paravaginal

cellular tissue. In front of the uterus and vagina very little pelvic cellular tissue separates these structures from the bladder and urethra. Similarly, immediately behind the uterus and vagina the peritoneum which covers the back of the uterus and the posterior vaginal wall reduces the pelvic cellular tissue to a minimum in these situations. Deep to the utero-sacral folds of peritoneum the pelvic cellular tissue is plentiful, and here it is

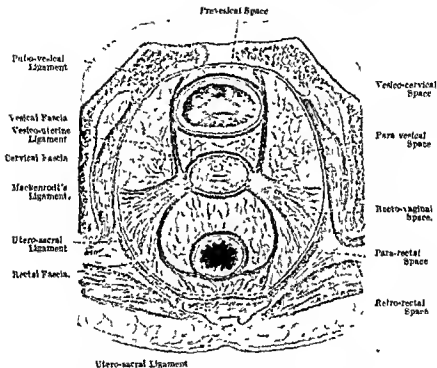


FIG. 12 The pelvic cellular tissue shown in cross-section of the pelvis. (Peham-Arnsch.)

condensed to form the utero-sacral ligaments which pass backwards and upwards from the uterus in front to reach the sacrum lateral to the sigmoid. The utero-sacral ligaments, help to support the uterus and prevent it from being forced down by intra-abdominal pressure. Plain muscle fibres can be demonstrated in the utero-sacral ligaments.

The tissues of the parametrium are condensed to form ligaments on each side of the cervix, immediately below the level of the internal os. Three names have been given to them, namely, the cardinal ligaments of the uterus, Mackenrodt's ligaments, and

the transverse cervical ligaments Mackenrodt's ligament spreads outwards in a fan shaped manner from the cervix and upper part of the vagina to extend as far as the wall of the pelvis. It lies below the level of the uterine artery, but is pierced by the ureter where a canal known as the ureteric canal is formed. Mackenrodt's ligament, like the utero sacral ligament, helps to support the uterus and prevents it from being forced down when the intra abdominal pressure is raised. It is composed almost entirely of connective tissue and contains very little plain muscle tissue.

The pelvic cellular tissue contains the uterine arteries and veins, together with the venous plexuses around the cervix and the lateral fornices of the vagina. The lymphatics from the upper two thirds of the vagina, from the uterus, from the ovaries and Fallopian tubes also pass through the pelvic cellular tissue. On each side of the uterus there is a small lymphatic gland known as the gland of the parametrium, about the size of a pin's head near the ureteric canal. The ureter passes through the parametrium and through the ureteric canal to reach the bladder, and its course is approximately antero posterior. It passes below the level of the uterine vessels, which cross it as they run transversely through the pelvis to reach the uterus. Sympathetic nerve ganglia and nerve fibres are plentiful in the parametrium.

In the condition parametritis the parametrium is inflamed, and characteristically there is a large effusion. The position of the effusion illustrates the anatomy of the parametrium. It extends as far down as the fascia covering the levator ani muscles and internally it comes directly into contact with the uterus and the upper part of the vagina. Laterally it extends as far out as the pelvic wall. Posteriorly it extends along the utero sacral ligaments in close relation to the sigmoid colon. Such an effusion may track upwards out of the pelvis to reach the subperitoneal tissues of the iliac region when the effusion may point above the Poupart ligament lateral to the great vessels. In other cases, the effusion may track upwards to the perinephric region. Again, in advanced cases of carcinoma of the cervix, the cancer cells infiltrate the parametrium when they spread either laterally along Mackenrodt's ligaments or posteriorly along the utero sacral ligaments. Clinically, infiltration of the parametrium is detected by determining the mobility of the uterus, by palpating in the situation of Mackenrodt's ligaments.

through the lateral fornix of the vagina and by examining the utero-sacral ligaments by rectal examination

THE PELVIC BLOOD VESSELS

The uterine artery arises from the anterior trunk of the hypogastric artery. Its course is at first downwards and forwards until it reaches the parametrium when its direction becomes transverse across the pelvis. It reaches the uterus at the level of the internal os, where it turns upwards, at right angles to its original direction, and follows a spiral course upwards along the lateral border of the uterus to the region of the uterine cornu, here it sends a branch to supply the Fallopian tube and ends by anastomosing with the ovarian artery. The tortuosity is obliterated when the uterus enlarges during pregnancy. During the vertical part of its course branches, which run transversely, pass into the uterus. It follows that the least vascular part of the uterus is in the midline—in consequence a midline incision is made in the uterus during the classical Cæsarian section operation. The vaginal branch of the uterine artery arises before the uterine artery passes vertically upwards at the level of the internal os. It passes downwards through the parametrium to reach the vagina in the region of the lateral fornix. The relation of the uterine artery to the ureter is of great importance. The uterine artery crosses above the ureter in the parametrium. The uterine artery runs transversely while the ureter runs approximately antero-posteriorly through the ureteric canal of the parametrium.

The Vaginal Arteries

Usually the blood supply of the upper part of the vagina is derived from the vaginal branch of the uterine artery. This vessel reaches the lateral fornix of the vagina and then passes downwards along the lateral vaginal wall. It sends branches transversely across the vagina, which anastomose with branches on the opposite side to form the azygos arteries of the vagina, which run down longitudinally, one in front of the vagina and one behind. These small vessels are encountered in the operations of anterior and posterior colporrhaphy. In some cases the vaginal artery does not arise direct from the uterine artery but

corresponds to the inferior vesical artery of the male, when it arises direct from the anterior division of the hypogastric artery

The ovarian arteries arise from the aorta just below the level of the renal arteries. They pass downwards to cross first the ureter and then the external iliac artery, and then they pass into the infundibulo pelvic fold. The ovarian artery sends branches to the ovaries and to the upper part of the Fallopian tube. It ends by anastomosing with the terminal part of the uterine artery.

The Pelvic Veins

The left ovarian vein ends by passing into the left renal vein. The right ovarian vein terminates in the inferior vena cava. The most important feature of the pelvic veins is that they form plexuses. These are well marked in the case of the ovarian veins in the infundibulo pelvic fold where they form a pampiniform plexus. The uterine plexus is found around the uterine artery near the uterus, the vaginal plexus around the lateral fornix of the vagina. These venous plexuses are well developed in cases of large myomata and during pregnancy. In these circumstances a venous plexus can be distinguished between the base of the bladder and the uterus.

The Arteries of the Vulva and Perineum

The blood vessels of the perineum and external genitalia are derived from the internal pudendal artery. The main vessel passes forwards in the ischio rectal fossa adjacent to the obturator internus muscle. It gives off the inferior hæmorrhoidal artery and the transverse perineal artery which supplies the perineum and the region of the external sphincter. It then pierces the triangular ligament and sends another transverse branch to supply the posterior part of the labia and to supply the erectile tissue which surrounds the vaginal orifice. The internal pudendal artery ends by supplying the clitoris and vestibule. The tissues around the vaginal orifice, around the clitoris and around the crura of the clitoris contain a large amount of erectile tissue. Lacerations of the anterior part of the vulva during child birth which involve these areas may be followed by severe bleeding.

THE LYMPHATIC SYSTEM

The lymphatics and lymphatic glands which drain the female generative organs are of importance, for they become involved in cases of carcinoma arising in these organs

The Lymphatic Glands

The lymphatic glands which drain the female generative organs are as follows —

The Superficial Inguinal Glands These glands consist of a vertical group and a horizontal group which lie parallel to Poupart's ligament. The horizontal group alone is concerned in the lymphatic drainage from the genitalia. The lymphatics from the whole of the vulva and from the lower third of the vagina pass to the horizontal inguinal group. Consequently, in such conditions as primary sore and Bartholin's abscess, the horizontal inguinal group becomes inflamed. There is some evidence that lymphatics from the fundus of the uterus pass along the round ligament and drain into this horizontal inguinal group.

The Gland of the Parametrium This is a small lymphatic gland about the size of a pin's head which lies in the parametrium near the situation where the uterine artery crosses the ureter.

The Hypogastric Glands The hypogastric group of glands are the regional glands for the cervix for the bladder, for the upper third of the vagina and also for the greater part of the body of the uterus. This group of glands may be extensively involved in cases of carcinoma of the cervix and of the vagina. The glands are most numerous immediately below the bifurcation of the common iliac where they are sometimes called the glands of the bifurcation. The lymphatics from the hypogastric lymphatic glands pass to the common iliac group.

The Sacral Group These glands lie on each side of the rectum and receive lymphatics from the cervix of the uterus and from the upper third of the vagina. These lymphatics pass backwards along the utero sacral ligaments. Two groups of glands can be recognised, a lateral group lying lateral to the rectum and a medial group lying in front of the promontory of the sacrum. The lymphatics from these glands pass directly either to the inferior lumbar group or to the common iliac group.

inguinal group The lymphatic drainage of the upper third of the vagina is the same as that of the cervix. The lymphatics from the middle third of the vagina pass to the hypogastric group.

The Lymphatics of the Vulva The lymphatics of the vulva end in the horizontal inguinal group.

THE URETHRA

The urethra measures between $1\frac{1}{2}$ and 2 in in length and passes downwards and forwards from the base of the bladder behind the symphysis pubis to end in the external urinary meatus. It has an epithelial lining which consists mainly of squamous epithelium although transitional cells are also present. Deep to the epithelium is a layer rich in small veins and connective tissue. Around this layer lies smooth muscle, and external to the smooth muscle striped muscle can be demonstrated.

THE EXTERNAL URINARY MEATUS

The external meatus lies below the clitoris and consists of two lateral lips. Immediately within the meatus one on each side, lie Skene's tubules, which extend for about $\frac{1}{2}$ in inwards lateral to the urethra. The ducts of small para-urethral glands are scattered around the external meatus. In cases of acute gonorrhoea Skene's tubules and the para-urethral glands are inflamed. Their ducts are reddened and discharge pus.

THE BLADDER

The bladder lies between the uterus and the symphysis pubis, being separated from the body of the uterus by the utero-vesical pouch of peritoneum. The ante-flexed uterus lies in contact with the top of the bladder so that when the bladder is empty its upper surface is concave. The bladder is covered by peritoneum on its upper surface and on each side.

The urachus passes from the apex of the bladder extra-peritoneally to the umbilicus. When the bladder is empty the mucosa of the bladder is thrown into folds as the result of laxity of the tissues of the submucosa. Few folds are found over the

trigone The trigone of the bladder is demarcated by the two ureteric orifices and by the internal urethral meatus The ureteric bar passes between the two ureters while posterior to the bar lies the retro-ureteric recess The importance of the

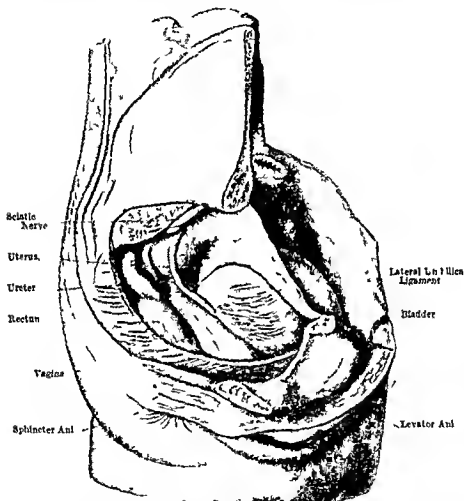


FIG 13 The pelvic organs seen laterally after the removal of the lateral wall of the bony pelvis (Veit Stoeckel)

retro-ureteric recess is that it is the part of the bladder which first prolapses in cases of cystocele The bladder consists of three layers, peritoneal, muscular and mucous with a sub-mucosa intervening between the mucous membrane and the muscle wall The bladder empties itself by contraction of the muscle wall which forms the detrusor vesicæ muscle The

bladder is closed by the contraction of the sphincter vesicæ muscle which lies around the meatus. The fibres of this muscle have a curved arrangement around the internal meatus and they pass upwards into the trigone of the bladder. During its contraction the muscle not only closes the internal meatus but also draws it up in a forward direction.

The sphincter urogenitalis is a striped muscle lying in the urogenital diaphragm. Some of the fibres of this muscle are attached to the posterior surface of the symphysis pubis and by acting as a sling hold up and support the urethra.

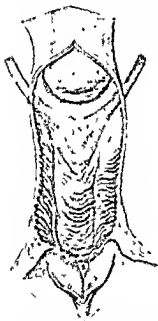


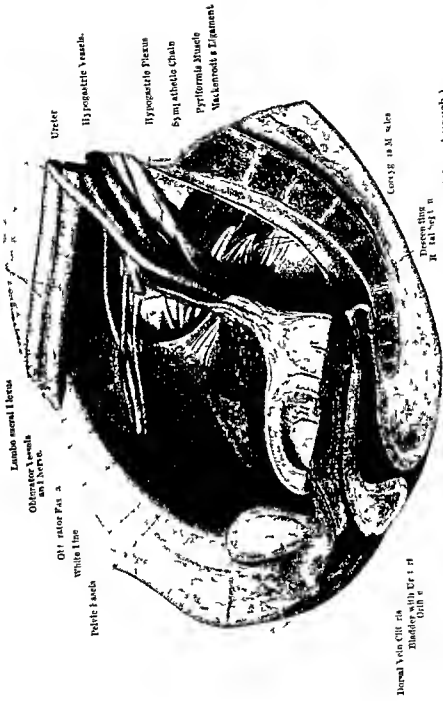
FIG 14. The relations of the bladder and ureters to the anterior vaginal wall. The posterior vaginal wall has been excised. (Pelham-Amreich)

THE URETER

The course of the ureter in the pelvis is important, for the ureter has to be dissected clear during Wertheim's operation and it may run in close relation to broad ligament myomata. The ureter passes over the bifurcation of the common iliac artery and runs downwards and forwards in the ovarian fossa deep to the peritoneum. In this situation the obturator vessels and nerve lie laterally, and the hypogastric lymphatic glands are closely related. The course of the ureter is then downwards and forwards immediately beneath the peritoneum.

The ureter pierces Mackenrodt's ligament where a canal, the ureteric

canal, is developed. It is obvious that the ureter must have room in which its peristaltic movements can be carried out without pressure from surrounding structures, and it is for this reason that the ureteric canal is differentiated. In its passage through the ureteric canal the ureter is crossed by the uterine artery and the uterine plexus of veins. After leaving the ureteric canal the ureter passes forwards and inwards to reach the bladder, being separated from the cervix on the right side by a distance of 1 to 2 cm. and on the left side by a distance of



The course of the ureter in the pelvis and its relations to the great vessels (Pelham Amreich)

superior hypogastric plexus, measures between 5 and 6 cm in length and is roughly triangular in shape with its apex near the bifurcation of the aorta. Its main supply is from the aortic plexus, but it also receives fibres directly from the sympathetic trunk. Below, the presacral nerve divides into two branches, the hypogastric nerves, which pass downwards laterally along the pelvic wall and terminate in the hypogastric ganglion or, as it is also called, the inferior hypogastric plexus. This ganglion is diffuse, but it lies in the situation of the utero sacral ligaments above the level of the pelvic fascia. Most of the fibres passing to the hypogastric ganglion are derived from the hypogastric nerve. It is also supplied by a few fibres direct from the sacral ganglia and some fibres from the superior hæmorrhoidal plexus, while the remainder of the nerve is derived from the *nervus erigens*, which belongs to the parasympathetic system. From the hypogastric ganglia nerve fibres pass to the ureter, bladder, rectum, uterus and the vagina.

The ovarian plexus, derived from the celiac and the renal ganglia, consists of fibres which follow the course of the ovarian vessels to reach the ovary, Fallopian tubes and also the fundus of the uterus.

The operation of presacral sympathectomy consists in excising the presacral nerve. The nerve fibres are easily displayed below the bifurcation of the aorta in front of the promontory of the sacrum lying deep to the peritoneum. The operation is employed in intractable cases of spasmodic dysmenorrhœa.

The parasympathetic system is represented by the *nervus erigens*, or the pelvic nerve, as it is sometimes called, which obtains fibres from the second and fourth sacral segments. The *nervus erigens* passes to the hypogastric ganglion.

Development of the Female Generative Organs

There is a close relation between the genital glands, the urinary organs, and the uterus and its appendages during early intra uterine life. If a transverse section is cut through the upper part of the cœlomic cavity of an embryo of eight weeks' development, the primitive mesentery is seen to project into the cœlomic cavity posteriorly near the midline. On each side of the primitive mesentery another projection, the intermediate cell mass, can be distinguished. On the inner side of the inter

mediate cell mass, by the end of the eighth week, a ridge has appeared, the genital ridge. The Wolffian body with primitive tubules and primitive glomeruli occupies the rest of the intermediate cell mass.

The primitive urinary system consists of the pronephros, the mesonephros, or Wolffian body, and the metanephros, which gives rise to the permanent kidney. Each of these systems is

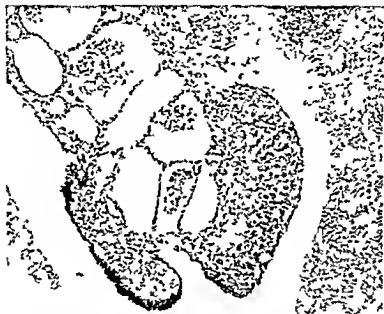


FIG. 15. The genital ridge. On the extreme right lies the mesentery of the primitive intestine. In the middle of the photograph the intermediate cell mass projects into the coelome. The genital ridge is differentiated on the inner aspect of the intermediate cell mass near the primitive mesentery. The surface epithelium together with the primitive columns can be seen. Primitive glomeruli lie in the deeper portion of the intermediate cell mass.

derived from the urogenital plates of the primitive somites. The pronephros corresponds to the hinder cervical, the Wolffian body to the dorsal and lumbar, while the metanephros is sacral in origin. Each system consists of a series of tubules and a collecting tubule or duct. In the human female the pronephros disappears, and the Wolffian body is represented by the straight tubules of the epoöphoron, or organ of Rosenmüller, found in the mesosalpinx of the adult, while the tubules of the paroöphoron represent the relics of the renal tubules of the Wolffian

system, Gartner's duct representing the Wolffian duct. The metanephros gives rise to the tubules of the permanent kidney, while the ureter and renal pelvis are formed from a diverticulum from the lower end of the Wolffian duct. The uterus and Fallopian tubes and most of the vagina are derived from the Müllerian ducts. The Müllerian duct is formed as a result of invagination of the mesothelium of the coelomic cavity on the ventral part of the intermediate cell mass. The invagination extends from the pronephros region above to the sacral region below, and both ducts terminate in the primitive cloaca. The position of the Müllerian duct is of importance, for it lies ventral to the Wolffian duct on the outer surface of the intermediate cell mass. In the human embryo the caudal parts of the two Müllerian ducts fuse to form the uterus, while the upper parts remain as the Fallopian tubes.

The uterus itself can be identified as early as the end of the third month. The upper end of the Müllerian duct becomes the abdominal ostium of the Fallopian tube and it is not uncommon for small accessory ostia to be found. There is no reason for believing that the abdominal ostium with its surrounding fimbriae represents the opening of the pronephric duct.

In its early stages of development the human uterus is bicornuate, corresponding in form to the uterus of lower mammals. Later, as the result of fusion of the two Müllerian ducts, a single uterus with a midline septum remains. During the 5th month of intra uterine life the septum disappears, and all that is left of it in the adult uterus are the anterior and posterior columns of the mucous membrane of the cervical canal. The muscle wall of the uterus is differentiated from mesoblastic tissues, and during the 5th month a circular layer of muscle can be distinguished. The longitudinal muscles of the uterus can be recognised during the 7th month, and this muscle layer is continuous morphologically with the plain muscle tissue of the ovarian ligament, the round ligament and the muscle fibres found in the utero sacral ligaments.

The primitive cloaca is divided through the formation of the urorectal folds into a ventral part, the urogenital sinus, and a dorsal part, the rectum. The lower ends of the Müllerian ducts terminate in the urogenital sinus. Around and below the lower ends of the two Müllerian ducts there is proliferation of mesoblastic tissues, and it is from this part of the Müllerian ducts that the vagina is developed by canalisation of the epithelial

core Just as in the case of the cervix, anterior and posterior columns can be recognised in the adult vagina which represent the remains of the septum between the two Mullerian ducts

In the early stage of development the cervix of the uterus is longer and thicker than the body, and this proportion persists until term The proportions may persist in adult life, when the uterus is described as infantile in type The cervical glands can be recognised during the 6th month, while the glands of the body of the uterus develop only during the last month of intra uterine life

The Urogenital Sinus and the External Genital Organs The cloaca becomes divided into two parts through the development of the urorectal septum, which originally consists of two folds which project on each side and then fuse caudally to divide the cloaca into a dorsal part, the rectum, and a ventral portion, the urogenital sinus The primitive cloaca is closed by the cloacal membrane, which can be recognised very early in the development of the embryo and from which the vessels of the allantois are developed The primitive intestine and the allantois enter the cloaca Both Wolffian ducts, both Mullerian ducts and the allantois from which the bladder and urethra are differentiated, enter the urogenital sinus Originally the ureter arises from the lower end of the Wolffian duct near the opening of the duct into the urogenital sinus Subsequently, as the result of the growth of the surrounding mesoblastic tissues, the ureter is displaced cranially so that it enters the urogenital sinus independently of the Wolffian duct This displacement of the ureter explains the aberrant types of ureter which are sometimes encountered in gynaecological surgery The part of the urogenital sinus which lies ventral to the mouths of the Wolffian ducts becomes differentiated into the bladder, while the allantois is represented by the urachus passing upwards from the apex of the bladder to the umbilicus The part of the urogenital sinus which lies caudal and dorsal to the mouths of the Wolffian ducts forms the sinus genitalis Subsequently a further mesenchymal fold, the vesico-vaginal septum, develops to project downwards caudally and separate the sinus genitalis from the rest of the urogenital sinus In this way, as the result of the development of the urorectal septum, the rectum becomes differentiated from the cloaca, and through the formation of the vesico vaginal septum the genital part of the urogenital sinus becomes separate from

that part which subsequently gives rise to the bladder and urethra

These processes can be detected if the development of the external generative organs is investigated. In the early stage the external organs are represented by the genital tubercle, on the summit of which is a phallus which gives rise to the penis in the case of the male and the clitoris in the case of the female. Dorsal to the genital tubercle lies the cloacal membrane. The next stage is represented by the development of outer genital folds which surround the genital tubercle and the cloacal membrane. Later, the outer genital folds fuse in the situation of the urorectal septum to divide the perineal region into the caudal anal portion and an anterior part, from which the vulva is formed. The next stage in the development of the vulva is the differentiation of two inner genital folds which pass backwards from the phallus to end near the situation of the urorectal septum. The outer genital folds give rise to the labia majora, the inner to the labia minora. It should be remembered that all three cavities, the urogenital sinus, the sinus genitalis and the rectum, are closed by a membrane which was originally derived from the cloacal membrane. At a later date in development the membrane breaks down so that three cavities open externally. The hymen represents the remains of this membrane at its junction with the lowest part of the sinus genitalis.

Development of the Ovary

The genital ridge extends from the pronephric region above to the sacral region below, and in its earliest form is represented by an elongated vertical prominence. Very soon it develops a mesentery of its own, the mesovarium, by which it is attached to the intermediate cell mass. The infundibulo pelvic fold passes upwards from the upper pole of the ovary and contains the ovarian vessels. The ovarian vessels of the adult, arising from the abdominal aorta, illustrate the original lumbar position of the upper part of the genital ridge. The genital fold of peritoneum passes downwards from the lower pole of the ovary to the region of the internal abdominal ring. The Mullerian duct originally lies on the outer aspect of the genital ridge, but it crosses the genital fold below. As the Mullerian duct crosses the genital fold the two structures fuse, and after muscle tissue has formed around the Mullerian duct, it passes into the tissues

of the genital fold. The part of the genital fold lying proximal to its point of intersection with the Müllerian duct becomes the ovarian ligament, while the distal portion becomes the round ligament.

The ovary descends from its original lumbar position so that at term it lies at the level of the pelvic brim with its long axis directed vertically.

The genital ridge gives rise to the sex cells of the ovary. The primordial sex cells can be distinguished by their peculiar mitochondria, and in lower animals there is some evidence that the cells migrate from the neighbourhood of the primitive intestine although there is no evidence of this migration in the human embryo. Very early in the development of the genital ridge a surface epithelium can be distinguished. This epithelium is morphologically continuous with the mesothelial cells of the primitive coelome and is represented in the adult by the cubical cells of the surface epithelium of the ovary. The primitive sex cells lie deep to the surface epithelium.

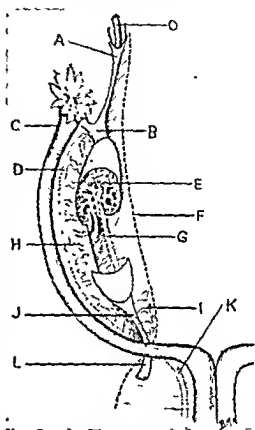


FIG. 16. Development of the ovary and Fallopian tube. At first they lie longitudinally. A, the infundibulo-pelvic fold; B, the suspensory ligament of the ovary; C, Fallopian tube; D, Wolffian duct (Gärtner's duct); E, the ovary cut across; F, mesonephric fold; G, the white line; H, tubules of the epoöphoron; I, the paroöphoron; J, the ovarian ligament; K, Gärtner's duct; L, the round ligament; O, ovarian artery (Halban-Seitz).

CHAPTER II

NORMAL HISTOLOGY

THE FOETAL OVARY

THE ovary is developed from the genital ridge. Quite early in development a surface epithelium becomes differentiated immediately beneath this epithelium a collection of large cells appears which constitutes the epithelial core of the primitive ovary, and lying more deeply is primitive mesenchymal tissue. The cells of the epithelial core can be termed "genitaloid", they have specific histological characteristics and can easily be recognised.

Three processes can be recognised in the development of the ovary —

(a) The septal growth of connective tissues and vessels from the hilum of the genital ridge. This growth splits the genitaloid cells into bunches of cells which constitute the "egg nests" of Waldeyer. At the surface, the connective tissues burrow circumferentially between the surface epithelium and the epithelial core to form the primitive albugina of the ovary.

(b) Some of the genitaloid cells which lie more deeply in the substance of the genital ridge burrow radially towards the periphery of the primitive ovary.

(c) Immediately beneath the surface epithelium, new genitaloid cells can be detected without suggestion of column arrangement. These cells arise perhaps from the surface epithelium, but it seems more likely that the majority of them originate from the epithelial core. In the early stages of development, genitaloid cells can be found amongst the mesothelial cells of the surface epithelium, but they disappear quite early in intra uterine life. The term germinal epithelium should be applied to the surface epithelium of the genital ridge only when it contains these genitaloid cells. There is little, if any, evidence that sex cells are derived from the surface epithelium either late in intra uterine life or afterwards.

The genital ridge in its early stages consists therefore of a surface epithelium, below which lie primitive sex cells tending to be arranged in columns, while the hilum of the ovary is occupied by mesenchymal tissue. These columns have in past years been known as the medullary cords. There is no communication between the medullary cords and the Wolffian system.

THE OVARY OF THE NEW BORN

At term the foetal ovary measures 10–16 mm in length and is situated at the level of the brim of the pelvis. If a section is taken through the ovary and examined histologically the following divisions can be recognised —

(1) The surface epithelium. This is a single layer of cubical cells, morphologically continuous with the mesothelium of the peritoneum, which gives rise later to the surface epithelium of the adult ovary. Sex cells can no longer be demonstrated in the surface epithelium.

(2) The subepithelial connective tissue layer. This layer gives rise to the albuginea of the adult ovary and to the basement membrane beneath the surface epithelium.

(3) The parenchymatous zone. This area is the most important, for it contains the sex cells. It can be subdivided into three zones

(a) Immediately beneath the surface epithelium the sex cells are still grouped together in bunches to form egg nests.

(b) Below this area the sex cells take the form of primordial follicles and are packed together without orderly arrangement.

(c) In the deepest part of the parenchymatous zone developing follicles can be recognised.

(4) The zona vasculosa. This area contains the blood vessels which pass into the ovary from the mesovarium. It constitutes the medulla of the ovary, the other layers forming the cortex.

The Primordial Follicle

The primordial follicle consists of a large cell, the primordial ovum, which is surrounded by flattened cells, best termed the

follicle epithelial cells. The follicle epithelial cells give rise to the granulosa cells of the Graafian follicle.

The primordial ova arise from the primitive genitaloid cells of the genital ridge. The primitive ovum is roughly spherical in shape and measures $18-24\mu$ in diameter, the nucleus 12μ and the nucleolus 6μ . It has a well-defined nuclear membrane and its chromatin stains clearly.

The ovary of the new born is packed with primordial follicles, and the most accurate computation of their number, due to

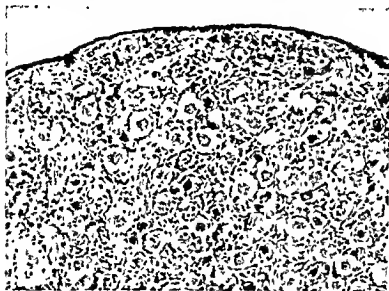


FIG 17 Ovary of a new-born child showing surface epithelium and the stroma packed with primordial follicles

Häggström, gives an estimate of approximately 200,000 to each ovary. One of the most curious features of the ovary is the tendency of the sex cells to undergo degeneration. An enormous number disappear during intra-uterine life, and this process of degeneration continues throughout childhood and the child-bearing period, with the result that no ova can be detected in the ovaries of a woman who has passed the menopause. Häggström showed that of 200,000 ova in the ovary of a child aged 3 years 8 months, 37,000 were degenerate.

The Graafian Follicle

The Graafian follicle, described by Regnier de Graaf in 1672,

is a vesicle whose size measures on the average between 12 and 16 mm. in diameter after puberty. Before then it seldom reaches more than 5 mm in diameter.

The mature Graafian follicle is spherical or ovoid in shape and contains pent-up secretion, the liquor folliculi. The follicle consists of two layers. The outer, or theca interna layer, consists of cells which are derived from the stroma cells of the cortex. Within the theca interna layer lies the granulosa cell layer which consists of cells which have a characteristic appear-

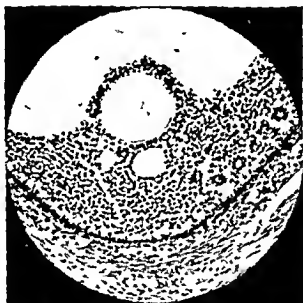


FIG. 18 Graafian follicle. Discus proliferus showing granulosa cells, the ovum, and the membrana limitans externa. Theca interna cells are few. The Call and Exner bodies are seen on the right in the granulosa layer.

ance. The cells are 8-10 μ in diameter. The nuclei always stain deeply and the cells contain relatively little protoplasm. In one area, the granulosa cells are collected together to form a projection into the cavity of the Graafian follicle. This projection is referred to as the discus oophorus. The ovum itself lies within the discus oophorus. With the exception of the area around the discus oophorus, the peripheral granulosa cells form a layer only a few cells in thickness, whereas at the discus the cells are between twelve and twenty layers thick. The granulosa layer itself is non-vascular and capillaries cannot be identified in the granulosa layer. Scattered amongst the granulosa cells,

particularly in the vicinity of the discus oophorus, are small spherical globules around which the granulosa cells are arranged radially. These structures form the bodies of Call and Exner. Between the granulosa layer and the theca interna is a basement membrane called the membrana limitans externa upon which lies the basal layer of granulosa cells.

The ovum measures $120-40\mu$ in diameter, its nucleus $20-25\mu$. At the periphery of the deutoplasm is a clear translucent capsular layer known as the zona pellucida. The granulosa cells surround the entire periphery of the ovum. Those which are immediately adjacent have a radial arrangement and form the corona radiata. The corona radiata remains attached to the ovum after the discharge of the ovum into the peritoneal cavity at ovulation. Sometimes more than one ovum is found in a similar follicle. The theca interna cells enlarge during the maturation of the follicle and shortly before ovulation they are larger than the granulosa cells. In animals a third layer, the theca externa is well defined but the layer is not distinguished in the human ovary.

The liquor folliculi is a clear fluid containing protein which coagulates after formalin fixation. It is secreted by the granulosa cells and contains the ovarian hormone oestrogen.

The Fate of the Graafian Follicle The process whereby a primordial follicle is converted into a Graafian follicle—follicularisation—can be recognised as early as the 32nd week of intrauterine life. Until puberty all Graafian follicles in the ovary undergo retrogression by a process which is termed follicle atresia. Ovulation whereby the follicle discharges its ovum into the peritoneal cavity, is first seen at puberty, and is restricted to the child bearing period of life. The factors which initiate the development of a primordial follicle into a Graafian follicle are unknown. There is a close relation between the activity of the anterior lobe of the pituitary and the development of Graafian follicles in the ovaries, but why only a few follicles are selected at any particular time is unknown. Even under the influence of massive doses of the anterior pituitary hormone only a relatively small number of primordial follicles undergoes hypertrophy.

The process of follicle atresia serves the purpose of producing the interstitial cells of the ovary.

Follicle Atresia Atresia may affect a follicle at any stage in its development. The first signs of degeneration are seen in the

ovum itself, which undergoes hyaline swelling and fatty degeneration. Subsequently the granulosa cells retrogress. On the other hand, the theca interna cells do not atrophy at the same rate, so that in the early stages of atresia the theca interna cells are larger and much more conspicuous than the cells of the granulosa layer. Hyaline tissue is now deposited beneath the membrana limitans externa to form the glass membrane, and the presence of the glass membrane in any follicle is a certain sign of degeneration. As atresia proceeds the liquor folliculi is gradually absorbed, while

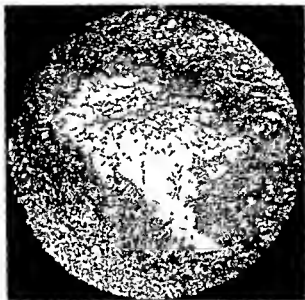


FIG. 19. Corpus atreticum. The end result of atresia of a Graafian follicle. The granulosa cells have disappeared and a hyaline lamina has been deposited. The follicle is in process of collapse.

more and more hyaline tissue is deposited in the glass membrane. Ultimately the ovum, the discus oöphorus and the granulosa cells disappear, so that the atretic follicle is surrounded only by the hyaline tissue of the glass membrane with deeply pigmented theca interna cells at the periphery. Eventually the follicle collapses, its cavity is obliterated and the opposing surfaces of the glass membrane come into contact, so that the end result is a tortuous laminated hyaline body with large deeply staining cells—originally theca interna cells—at the periphery. These large brown cells are the interstitial cells of the ovary.

Interstitial Cells Interstitial cells are found in the ovary of

the new born and throughout adolescence. It was once believed that the cells were found in large numbers at the time of puberty, and the term puberty gland was at one time widely used. There is little evidence that the interstitial cells increase in number at the time of puberty. On the other hand, the cells are produced in large number during pregnancy. During pregnancy ovulation is inhibited, although the process of follicle ripening continues.

The interstitial cells are invariably present in the human ovary until the menopause is reached, so that it is reasonable to believe that they exercise some function. It will be shown later that the retrogressing corpus luteum produces cells which correspond fairly closely to the interstitial cells, and it has been suggested that such cells enhance the effect produced by the interstitial cells alone. There is no direct evidence as to the function of the interstitial cells, for no hormone has been isolated from them. Nevertheless, there is very good reason to believe that the secondary sexual characteristics are determined by secretions of the interstitial cells. The causation of those characters will be discussed under ovarian physiology.

The Ripening Follicle Ripening follicles can be demonstrated in the ovaries during the post menstrual phase when they can be seen with the naked eye, for they often reach a size of more than 10 mm in diameter. The characters of the process of ripening have already been described under the "Histology of the Graafian Follicle". At the beginning of ripening the discus oöphorus is directed towards the medulla of the ovary, and the mechanism whereby a follicle penetrates through the cortex and discharges its ovum into the peritoneal cavity is remarkable. As the follicle hypertrophies more and more liquor is secreted, and the direction in which the follicle develops is determined by a rapid growth of the theca interna cells in that part of the follicle which is directed towards the surface epithelium. If a ripening follicle is examined the advancing cone of theca interna cells can be demonstrated in this part of the follicle. The cells burrow through the cortex of the ovary, so that as the follicle enlarges it develops towards the surface and not towards the medulla. In addition the discus oöphorus rotates, so that when the follicle is on the verge of rupture it lies immediately beneath the surface of the ovary. Throughout the process of ripening the granulosa layer is non-vascular, but because of the hyperæmia of the theca interna

layer, it is not uncommon for interstitial hæmorrhage to be formed in the theca interna layer

THE MENSTRUAL CYCLE

In healthy women the menstrual cycle is one of about twenty eight days and covers the time between the first day of one menstrual period and the first day of the next. The average duration of menstrual bleeding is between three and five days. A cycle of twenty eight days is present in about 60 per cent of healthy women. It has been shown by Gunn, Jenkin and Gunn that almost all women have a slight irregularity in the menstrual cycle. They state that the typical difference between the shortest interval and the longest is eight or nine days, and the difference is six days or more in 84 per cent of women. In some women the cycle is twenty one days or less, and it is not uncommon for menstruation to start at puberty with a cycle of three weeks instead of the average one of twenty eight days. It has been found most convenient to date the phases of the menstrual cycle in terms of the number of days after the first day of the last period.

No explanation has been given of the control of the rhythm of the menstrual cycle. It is probable that the anterior lobe of the pituitary dominates the sexual cycle, but as yet rhythmical changes in the anterior lobe of the pituitary have not been found. In the Middle Ages the rhythm of twenty eight days was attributed to lunar influences, and there is some evidence that ultra violet light induces sexual activity in lower animals, thus explaining the summer breeding seasons. Amongst the Esquimaux, menstruation is restricted to the time of the mid night sun and amenorrhœa is the rule during the winter months. Conversely a reduction in the menstrual cycle is common with European women visiting tropical climes.

The menstrual cycle is the outward and visible sign of the periodic activity of the ovaries. This point is of clinical importance, for an alteration in the menstrual rhythm can only be due to a disturbance of ovarian activity. Diseases of the uterus itself cannot alter the rhythm of the menstrual cycle.

OVULATION

Immediately prior to rupture, the ripening follicle lies near the surface of the ovary with the discus oophorus directed towards

the peritoneal cavity. The theca interna layer is full of dilated capillaries, and a plug of coagulated plasma now appears in the most advanced part of the theca interna layer. The process of ovulation can be studied in such animals as the rabbit and ferret where ovulation occurs at a fixed time following coitus. In such cases an elevation develops on the surface of the ovary, upon which conspicuous radially arranged capillaries can be distinguished. Probably a similar mechanism obtains in the human ovary. The ovum is discharged into the peritoneal

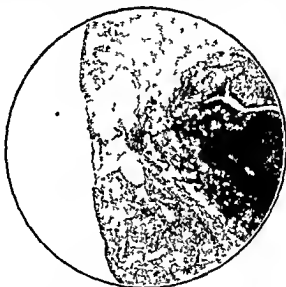


FIG. 20. A recently ruptured follicle. The surface of the ovary lies on the left and the cavity of the follicle is represented by the thin space to the right. The stigma has been closed by a plug of plasma. The dark area represents hemorrhage into the theca interna layer.

cavity when the intrafollicular pressure is sufficient to burst through the intervening tissues. The corona radiata of granulosa cells accompanies the ovum during its discharge into the peritoneal cavity. The aperture through which the ovum is discharged, called the stigma, is closed almost immediately after ovulation by a plug of plasma. Prior to ovulation the granulosa layer is non-vascular and the capillaries and interstitial hæmorrhages of the theca interna layer are separated from the cavity of the follicle by the membrana limitans externa. Consequently, in spite of the sudden release in intrafollicular pressure as the result of ovulation, blood is not effused into the cavity of the

follicle The ruptured follicle collapses and its opposing surfaces come together; there is also some distortion of the wall so that already there is a tendency for small convolutions to be present.

Ovulation is restricted in the human subject to about the fourteenth day of the menstrual cycle. The time of ovulation has been determined by the following methods —

(1) By demonstrating recently ruptured follicles in ovaries removed by operation. It is important that the material examined should be dated accurately. Also it should be noted that the time of ovulation varies with the particular cycle for the women concerned. It has been shown by Ogino and others that in cycles of less than twenty eight days the time of ovulation is antedated, so that it may occur as early as the seventh day of the cycle. Ogino has emphasised that the constant feature of all menstrual cycles is the interval between the ovulation time and the onset of the next period. This seems to be fixed at fourteen days.

(2) By demonstrating the human ovum in washings obtained from the Fallopian tube during pelvic operations. This method, employed by Allen, is the most convincing of all. Allen was able to show that ovulation is restricted to about the fourteenth day of the cycle.

(3) By identifying the time of onset of the secretory phase in the endometrium during the menstrual cycle. It will be shown later that the endometrium develops specific histological characters in the latter part of the menstrual cycle which are attributed to the influence of the corpus luteum. The method is indirect, but it serves to confirm the view that ovulation is restricted to about the fourteenth day.

(4) By determining the onset of *Mittelschmerz*. Some women develop severe ovarian pain half way between their menstrual periods. It is possible that the pain is due to the tension within the ovary caused by the presence of a follicle on the verge of rupture. If this supposition is correct the time of ovulation should correspond to the onset of *Mittelschmerz*. This method of determining the time of ovulation is obviously unreliable.

Schröder maintains that ovulation is restricted to about the fourteenth day and believes that there is little variation in the ovulation time, never more than two days from the fourteenth day. Corner and others believe that a wider variation is possible. Similarly, embryologists (Grosser) have had difficulty in accepting the view that ovulation is restricted to this time,

for on this basis there has been difficulty in accounting for the size of some specimens of early human ova. Again there is some clinical evidence that ovulation can be "provoked" by coitus, but it is possible that such cases can be explained in other ways than by postulating a variation in the ovulation time.

Ovulation must be regarded as an essential factor in the normal human menstrual cycle. In some cases of pathological uterine hæmorrhage ovulation is inhibited, but in normal menstrual cycles ovulation always takes place. In monkeys, particularly the macaque monkeys studied by Corner and Hartmann, cyclical uterine bleeding may occur independently of ovulation, and there is some evidence that anovular cyclical bleeding may be encountered in the human subject, but such cases are rare and the hæmorrhage should be regarded as pathological.

Corner takes the view that any cyclical bleeding should be regarded as menstruation. Some gynaecologists, however, insist that menstruation in the human subject should be defined as bleeding which follows upon ovulation and the development of a corpus luteum in the ovaries. Uterine bleeding, whether cyclical or not, which is not preceded by ovulation, should, in their view, be regarded as pathological. It will be shown later that there is no satisfactory explanation even at the present day, of the cause of menstrual bleeding. Moreover, it should be remembered that anovular bleeding (Macaque) is restricted to the time of year when menstruation is irregular.

Usually only a single ovum is discharged from one or other ovary at the time of ovulation, but sometimes two recently ruptured follicles are found in the same ovary. If both discharged ova become fertilised, bimovular twins will develop. It has been shown that the distribution of corpora lutea between the two ovaries is even, which implies that ovulation alternates between the two ovaries. Probably the alternation is not invariable, not more so than can be accounted for by the law of chance.

The Corpus Luteum

After ovulation the ruptured follicle develops into a corpus luteum. The term *corpus luteum* is in some ways a misnomer, for the colour is grey or greyish yellow until the onset of the next menstrual period. The yellow colour is characteristic of the retrogressing corpus luteum and of the corpus luteum of pregnancy.

Immediately after ovulation the granulosa cells undergo hypertrophy and hyperplasia and mitotic figures are numerous. Instead of being two or three cells thick, as many as eight or ten cell layers can soon be recognised. Simultaneously there is hypertrophy of the theca interna cells, so that in the early stages of development of the corpus luteum the theca interna cells outstrip the granulosa cells in size. The majority of the lutein cells of the corpus luteum are derived from the granulosa layer



FIG. 21. Mature corpus luteum of the menstrual cycle. The photograph illustrates the convex border of a convolution of the corpus luteum. The small dark cells at the periphery are paralutein cells, while the larger cells with a tendency to a radial arrangement consist of granulosa lutein cells. The corpus luteum is approaching maturity, so the cells stain fairly uniformly.

and form the granulosa lutein cells. The theca interna cells persist at the periphery and in the septa of the corpus luteum, and are sometimes termed paralutein cells.

Proliferation of the corpus luteum continues until about the twenty-second day of the menstrual cycle. The granulosa cells at first become spindle shaped with the long axis of the cells directed radially. The cells hypertrophy and the protoplasm becomes pigmented. It is unknown what happens to the bodies of Call and Exner; they can be detected in the early stages of development, but they disappear before the stage of maturity is

reached. The convolutions of the corpus luteum are produced almost entirely as the result of proliferation of the granulosa cells. The convoluted body has a much larger surface than one which is smooth and spherical. The theca interna cells do not invade the granulosa lutein layer, but are restricted to the periphery.

The vascularisation of the corpus luteum proceeds regularly and simultaneously with the development of the granulosa lutein

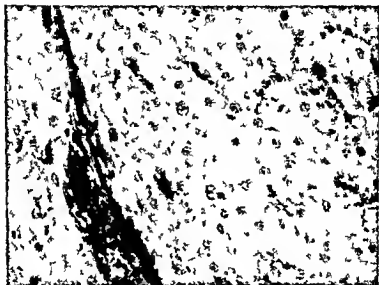
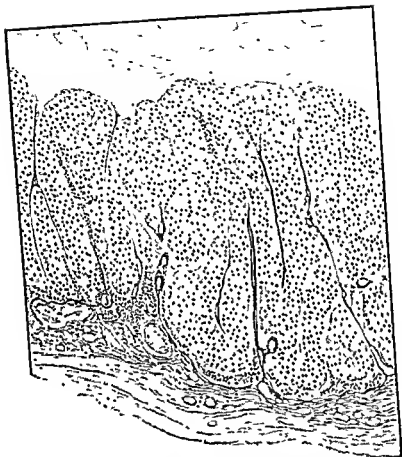


FIG. 22. Mature corpus luteum of the menstrual cycle. The large polyhedral cells with granular protoplasm are mature granulosa lutein cells. The nuclei and nuclear figures will repay a careful study. Towards the left the dark septum between the adjacent convolutions contains paralutein cells.

layer. During the development of the granulosa lutein layer some of the young capillaries may rupture, so that blood may be discharged into the cavity. It has already been pointed out that hæmorrhage into the cavity is not the normal sequel of ovulation. On the other hand hæmorrhage into the cavity during the stage of proliferation is relatively common, particularly in those cases in which the ovaries are hyperæmic.

The corpus luteum attains its stage of maturity by the twenty-second day and persists as such until the onset of menstruation. The granulosa lutein cells stain uniformly and pigmentation of their protoplasm is not so well marked as during the stage of

PLATE III



Mature corpus luteum of the menstrual cycle stained with hæmatoxylin
and van Gieson.

proliferation. The fully formed granulosa lutein cell is a large cell between 13 and 14 μ in diameter, and its protoplasm is faintly granular. The theca interna or paralutein cells are now much smaller than the granulosa lutein cells. Their protoplasm is densely pigmented and during the stage of maturity contains lipoids. Lipoids do not appear in the protoplasm of the granulosa lutein cells until immediately before menstruation begins. Small spherical colloid bodies which stain brown with

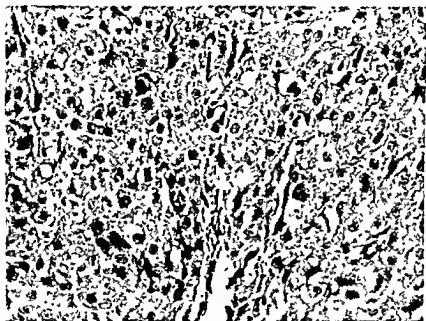


FIG 23. Corpus luteum of the menstrual cycle on the first day of the period of bleeding. The lutein cells have shrunk and there are spaces between the individual cells.

Van Gieson's stain appear amongst the cells of the granulosa lutein layer during the stage of maturity, but they become much more numerous and larger in the corpus luteum of pregnancy. The cavity of the corpus luteum during the stage of maturity contains a few connective tissue cells together with a layer of fibrin which lies immediately adjacent to the granulosa lutein layer: red blood corpuscles are also found when the ovaries are hyperæmic.

Retgression of the Corpus Luteum. Unless the ovum discharged at ovulation is fertilised, the corpus luteum starts to retrogress immediately before menstrual bleeding begins.

During retrogression, large vacuolated cells, together with deeply pigmented degenerate cells, can be distinguished in the granulosa lutein layer. The protoplasm of the lutein cells becomes infiltrated with lipoids early in the process of retrogression. By the third day of the menstrual hæmorrhage retrogression is well marked. Fatty infiltration is well shown in the paralutein cells, but the paralutein cells do not atrophy at the same rate as the granulosa lutein cells, and they persist at the periphery of

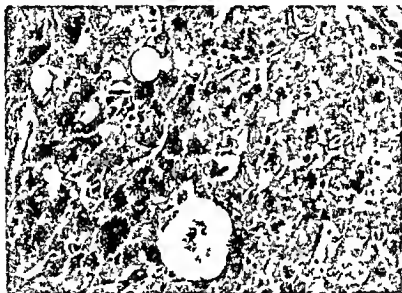


FIG. 24. Corpus luteum of pregnancy thirty-eight days from the first day of the last period. The lutein cells are large, packed with granules, but the outline of the cells is irregular. Large spaces full of secretion can be seen. Same magnification as Figs. 21 and 22.

the retrogressing corpus luteum even after all the granulosa lutein cells have disappeared.

The other characteristic feature of retrogression is the deposition of hyaline tissue amongst the granulosa lutein cells. The hyaline tissue resembles that found in the glass membrane of atretic follicles, and as retrogression proceeds more and more hyaline tissue is deposited, while scattered at the periphery are interstitial cells derived from the paralutein cells. The hyaline body is termed the *corpus albicans*, and differs from the other hyaline atretic bodies of the ovaries in its size and in the thickness of the hyaline layer.

Retrogression of the corpus luteum is a slow process, and it has been calculated that nine months elapse before the corpus luteum is completely replaced by hyaline tissue.

Corpus Luteum of Pregnancy. If the ovum discharged from the Graafian follicle is fertilised the resulting corpus luteum of pregnancy develops certain features which are not seen in the corpus luteum of the menstrual cycle. The corpus luteum of pregnancy is larger and is almost invariably cystic in the early

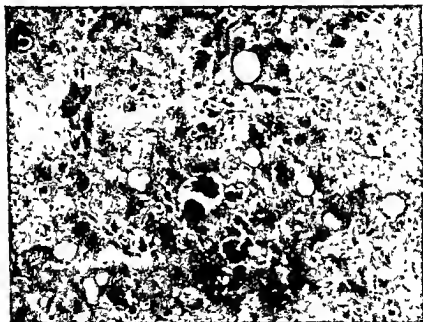


FIG 25 Corpus luteum of pregnancy 20th week, showing that the cells are conjoined. There are still large spaces full of secretion, while the dark rounded bodies are colloid bodies.

months, when it contains clear yellow fluid. The convolutions are larger and more intricate. Moreover, the individual granulosa lutein cells are much more hypertrophied and measure between 40 and 50 μ . In early pregnancy the protoplasm of the granulosa lutein cells is packed with secretion globules and clear spherical spaces, full of secretion, appear between the individual cells. Colloid bodies are always more numerous than during the menstrual cycle. The colloid material is probably secreted by some of the granulosa lutein cells and is most plentiful about the 24th week of pregnancy. The paralutein cells hypertrophy in the early weeks of pregnancy, but they disappear at about

the 20th week and cannot be demonstrated in the latter half of pregnancy. Already at the 20th week, hyaline tissue is being deposited in the cavity of the corpus luteum adjacent to the lutein cells and a small amount has appeared around the capillaries of the *granulosa lutea* layer. The structure of the corpus luteum remains stationary until near term, when deposits of calcium in the form of psammomatous bodies staining deeply with hæmatoxyline can be recognised. There is much variation amongst individual specimens in the lipid content of the lutein cells. The cells of the corpus luteum of pregnancy contain on the whole very little fat.

It is possible to trace the transition between the corpus luteum of the menstrual cycle and the corpus luteum of pregnancy. Both structures arise in the same way, but the features of the corpus luteum of pregnancy indicate that it secretes more actively than the corpus luteum of the menstrual cycle. The presence of *granulosa lutea* cells in the latter part of pregnancy indicates that some function is still exercised by the corpus luteum. On the other hand the corpus luteum of pregnancy is most active in the early weeks. The retrogression of the corpus luteum of pregnancy during the puerperium has not been studied, for such specimens are rarely obtained. There is some evidence that retrogression is rapid but the precise mechanism is unknown.

THE ENDOMETRIUM OF THE UTERUS

The endometrium of that part of the uterus which lies above the level of the internal os consists of a surface epithelium glands and a stroma. It was not until 1907 that the variations in the histological structure of the endometrium during the menstrual cycle were established by Hitschmann and Adler. Before that time there was much confusion for, as the result of the examination of curettings it was known that different histological pictures of the endometrium were common. Ruge in 1897 had classified what he considered to be the abnormal forms into three main groups: he regarded all three as pathological and considered them to represent different types of endometritis. The three forms were the interstitial the glandular and the mixed. This classification was accurate in so far as it illustrated the types of variation in the endometrium. In 1907 Hitschmann and Adler examined specimens of the

endometrium at different stages of the menstrual cycle and showed conclusively that the structure was not constant, but was subject to variations which were physiological. They showed that glandular endometritis represented the physiological hypertrophy of the endometrium during the premenstrual stage of the cycle. They demonstrated that interstitial endometritis alone represented the results of an infection, and emphasised that the histological features in interstitial endometritis were comparable to those seen in similar infective processes in other parts of the body.

The work of Hitschmann and Adler not only revolutionised the previous conception of endometritis, but formed the basis upon which much of the modern work on the sex hormones rests.

The endometrium of the body of the uterus can be divided into two zones—a superficial, termed the functional, and a deeper layer, termed the basal layer, which lies adjacent to the myometrium. The stroma cells of the basal layer stain deeply and are packed closely together. In the basal layer are found thick-walled capillaries and lymphnodes.

The Proliferative Phase The phase of the menstrual cycle which starts when regeneration of the menstruating endometrium is complete and lasts until the fourteenth day of the cycle is referred to as the proliferative phase. During proliferation the functional and basal layers are well defined. The basal layer measures 1 mm in thickness, while the functional layer, commencing with an average of 2.5 mm, reaches about 3.5 mm by the fourteenth day, and during the secretory phase hypertrophies still further, so that immediately after menstruation its average thickness is between 3.5 and 4 mm. There is much variation in the thickness of the functional layer, and it is not uncommon to see specimens in which it is as much as 8 mm. During the proliferative phase the glands of the functional layer are simple tubules with regular epithelium. About the tenth day of the cycle the glands become slightly sinuous and their epithelium becomes more columnar than before. The stroma becomes extremely oedematous with wide separation of individual cells (Fig. 5, p. 9). The capillaries dilate in the superficial part of the functional zone. In some cases the haemorrhage is so intense that blood oozes into the cavity of the uterus to be discharged from the vagina. Regular intermenstrual bleeding of this kind is a well known clinical symptom and is

due to the intense hyperæmia of the proliferative phase. It is important to remember that the onset of proliferation follows immediately upon repair of the endometrium which has been denuded by menstruation.

The Secretory Phase The secretory phase of the endometrium begins on the fifteenth day and persists until the onset of menstruation. The most characteristic signs of this phase are found in the glands. Their epithelial cells develop spherical



FIG. 26 Endometrium. Secretory hypertrophy. The glands are corkscrew-shaped, the lumen contains mucous secretion and the inner border of the cells is irregular. The surrounding stroma is oedematous and the hypertrophied stroma cells are widely separated from each other.

translucent areas between the nuclei and the basement membrane which contain the precursors of the glandular secretion and which persist until about the twenty first day of the cycle. In the latter part of the secretory phase the inner border of the epithelial cells becomes irregular through the discharge of secretion into the lumina of the glands, while shortly before menstruation the glands are full of coagulated secretion which stains deeply with eosin. The glands become crenated and assume a characteristic corkscrew shaped form. The stroma of the functional layer remains oedematous, but further interstitial hæmorrhage is rare.

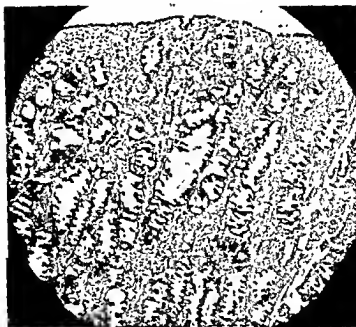


FIG. 27. The endometrium of the uterus showing well-marked secretory hypertrophy.

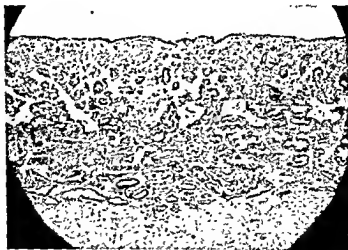


FIG. 28. Endometrium on the first day of the menstrual bleeding. The patient started to menstruate half an hour before the commencement of operation. The superficial layers are degenerate, while below secretory hypertrophy of the glands can be seen. The photograph illustrates approximately how much of the endometrium is shed during menstruation.

except immediately prior to the onset of menstruation. The stroma cells become swollen and after the twenty first day of the cycle they tend to be collected immediately beneath the surface epithelium where they surround the ducts of the glands in such a way that the functional layer can be subdivided into two zones the superficial or compact and a deeper spongy layer. The swollen stroma cells of the compact part of the functional layer represent young decidual cells and in every respect the reaction of the compact zone corresponds to what is found in



FIG. 20 The menstruating endometrium first day illustrating the degeneration of the superficial layers. Below lie corkscrew shaped glands.

this part of the endometrium during pregnancy. The lymph nodes of the basal layer of the endometrium scatter lymphocytes into the functional layer in the last few days of the menstrual cycle, so that, at this stage there is a well marked lymphocytic infiltration of the whole of the endometrium.

The Menstruating Endometrium The menstrual changes in the endometrium are essentially degenerative. The first sign of degeneration is found along the course of the capillaries of the compact part of the functional layer. As a result of the breaking down of the capillary endothelium small hæmorrhages develop

and disintegration of adjacent glands can be demonstrated. The compact zone of the functional layer becomes infiltrated with a large number of cells and the surface epithelium may be pushed away from the subjacent stroma. A little later the glands of the spongy zone of the functional layer disintegrate so that the epithelial cells separate from each other and become scattered amongst the red blood cells, leucocytes and stroma cells of the stroma. The degenerative process is rapid, so



FIG. 30 Menstrual necrosis First day of the period of bleeding
The endometrial gland is being broken up, and the stroma is infiltrated with round cells and red blood corpuscles

that by the second day of the period of bleeding the compact zone and the superficial part of the spongy zone have degenerated and a large proportion has been discharged into the cavity of the uterus. It is certain that the whole of the compact zone of the functional layer is shed and probably at least half of the spongy zone of the endometrium. On the third day of the period of bleeding the surface of the endometrium is raw and the patulous glands of the functional layer open directly into the cavity of the uterus. Active degeneration seems to be restricted to the first two days of menstruation; the subsequent bleeding is the result of oozing from the capillaries of the denuded stroma.

It is common to find relics of the glands and stroma of the endometrium in the shreds and clots passed on the first day of the period of bleeding, which affords conclusive proof that a large part of the endometrium is shed in normal menstruation. There is reason to believe, however, in cases of abnormal uterine hæmorrhage that the disintegration processes are not spread uniformly over the endometrium, but are localised to limited areas.

Regeneration Regeneration of the denuded epithelium is already in progress before menstrual bleeding has stopped and is complete forty eight hours after the end of menstruation.



FIG. 31. Endometrium on the last day of the period of bleeding illustrating the compact stroma and the method by which the bare denuded area is covered by epithelium which grows over it from the glands.

Repair is brought about by the glandular epithelium growing over the bare stroma. It is not uncommon for relics of crenated glands to be found in the endometrium during the first two days following menstruation, and one of the great characteristics of the endometrium at this time is the presence of a large number of lymphocytes in the stroma. The relation between the cyclical alterations in the ovaries and in the endometrium will be discussed in Chapter III.

The Decidua of Pregnancy In the early weeks of pregnancy the structure of the endometrium is very similar to that found late in the secretory phase. The division into compact and spongy zones of the functional layer is more clearly defined. The basal layer can still be identified, but its glands, although

staining more deeply than the hypertrophied glands of the spongy layer, show some degree of crenation and contain secretion. The lymphnodes of the basal layer are not easily identified, for in the early weeks of pregnancy lymphocytes are disseminated extensively into the stroma of the spongy layer. The glands of the spongy layer retain the general form found late in the secretory phase, but they are much more crenated, so much so that the impression is given that they have increased

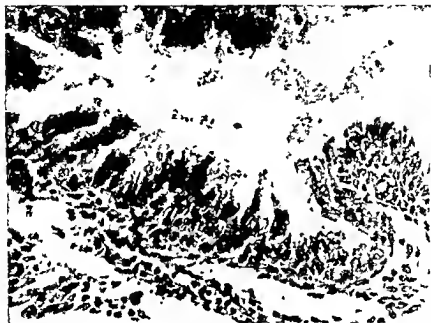


FIG. 32 Early decidua of pregnancy on the thirty-eighth day of pregnancy. The same magnification as Figure 26. There is well marked activity of the glandular epithelium and the lumen of the gland contains secretion.

in number. The cells lining the glands are irregular in shape and tend to be elongated with irregular processes projecting into the lumina of the glands and discharging secretion. It is not uncommon for small papillæ to be formed which project into the glands, but in spite of the activity of the epithelium the basement membrane remains well defined. Activity is not restricted to the immediate vicinity of the implanted ovum, but is distributed uniformly through the endometrium of the body of the uterus. The compact layer shows the typical decidual reaction of pregnancy. The decidual cells are derived from

stroma cells; they are stellate in shape, contain glycogen, and are surrounded by an intercellular fibrillary ground substance and by lymphocytes

Ectopic Decidual Cells Decidual cells are not restricted to the endometrium of the body of the uterus. Decidual reaction, in which decidual cells are surrounded by a fibrillary matrix and lymphocytes, has been demonstrated in various ectopic situa-

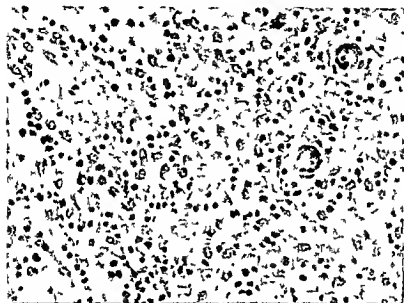


FIG. 33 Decidual cells of early pregnancy. The decidual cells are large cells with faintly staining protoplasm and an indefinite cell outline. They are always surrounded by lymphocytes and the cells fuse with an intercellular matrix.

tions in the pelvis. The best example of ectopic decidual reaction is found on the surface of the ovaries during pregnancy, when small irregular reddish areas are easily recognised with the naked eye and show typical decidual reaction on histological examination. In the ovaries the decidual reaction is limited to the surface with very little invasion of the cortex. Ectopic decidual reaction is always very well marked beneath the peritoneum of the back of the uterus near the pouch of Douglas. It has been demonstrated in adenomyomata, in the walls of chocolate cysts, on the utero vesical fold of peritoneum and in

the omentum Decidual reaction can invariably be demonstrated in the isthmus region of the endometrium during pregnancy, but only in about 25 per cent of cases is the reaction found in the endometrium of the cervical canal It has been shown that a similar ectopic decidual reaction can be demonstrated during the latter part of the secretory phase of the menstrual cycle The significance of ectopic decidual cells is unknown It will be shown later that decidual reaction is controlled by the corpus luteum but it is unknown why only cells with this curious distribution respond to the stimulus

Transport of the Ovum

After ovulation, the ovum, surrounded by the corona radiata of granulosa cells, is transported into the Fallopian tube The factors which control this migration are not known with certainty Particulate matter, after injection into the peritoneal cavity, is carried into the Fallopian tube and it is generally believed that this motion is determined by currents induced by the ciliary movement of the tubal epithelium It is possible that similar currents carry the ovum to the region of the abdominal ostium otherwise it is very difficult to explain cases of abdominal migration of the ovum from the ovary of one side to the Fallopian tube of the other Such cases are well authenticated in the human subject and have been induced experimentally in animals Recent experimental work has indicated that ciliary movement is not the sole factor which controls the transport of the ovum Corner and others have found that the spontaneous contractions of the Fallopian tube are increased during œstrus, and peculiar distortions and contractions of the Fallopian tube have been seen by endoscopic intraperitoneal examination of the pelvis of the Macaque monkey at the time of ovulation The transport of the ovum from the surface of the ovary to the abdominal ostium seems to be determined by factors which approach rather to vitalism than to a simple mechanistic explanation Similarly, it has been shown experimentally that the ciliary movement of the tubal epithelium is insufficient of itself to carry forward the large mammalian egg Again it has been shown that premenstrual hypertrophy can be distinguished in the mucous membrane of the Fallopian tube which may have some bearing on the transport of the ovum It is believed that fertilisation takes place in the Fallopian

tube Corner has proved this to be the case with the sow, and the incidence of extra uterine gestation in the human subject shows that fertilisation can be extra uterine

If the ovum is not fertilised it undergoes degeneration, and Allen succeeded in obtaining specimens of degenerate ova in washings from the Fallopian tube It is very doubtful whether such degenerate ova reach the cavity of the uterus

The Fertilised Human Ovum

In recent years several specimens of the early human ovum have been obtained, and much advance has been made in the interpretation of its development The features of the ovum in the earliest stages are still indeterminate It is believed by comparison with specimens obtained from animals that two groups of cells become differentiated early in division, so that even in the morula stage the cells of the segmenting ovum form



FIG. 74. Early human embryo dated as thirty eight days from the first day of the last menstrual period. To the right lie the chorionic villi and decidua. The embryo which consists of two vesicles lies in the extra embryonic mesoderm. The amniotic sac which lies above and to the right is separated from the yolk sac lying below and to the left by the embryonic plate. The primitive streak is shown. The endoderm of the yolk sac has separated from the mesoderm which is burrowing laterally from the primitive streak.

a peripheral group, the trophoblast, and an inner group of smaller cells, the embryoblast. It has been shown that the corona radiata surrounds the ovum in the Fallopian tube prior to fertilisation, but there is no reason to believe that the granulosa cells take any part in the development of the trophoblast. In the next stage of development the trophoblast separates from the embryoblast so that an intermediate layer of cells can be distinguished called the extra-embryonic or chorionic mesoderm. These cells are quite different from the mesoderm

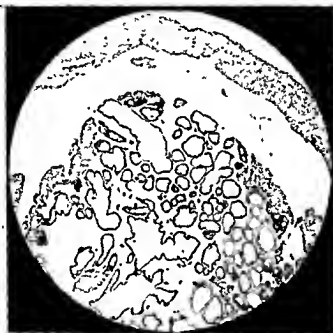


FIG. 35. Chorionic villi from an ovum which is calculated as thirty-eight days from the first day of the last period. Above lies the decidua reflexa, while below are primitive chorionic villi surrounded by cytotrophoblast.

of the embryo proper, which develops from the primitive streak. Later in development the chorionic mesoderm splits into a peripheral layer adjacent to the trophoblast: intervening is the cavity of the blastocyst called the magma reticulare. Simultaneously with the development of the magma reticulare the cells of the embryoblast arrange themselves to form two vesicles, the amnion and the yolk sac, which are attached to the trophoblast by the connecting stalk. The embryoblast always lies adjacent to the decidua basalis, at the pole opposite to that

where the ovum has burrowed through the endometrium during implantation. This stage of development can be seen in the ova of Kleinhans, Miller, and Bryce Teacher. Later the chorionic mesoderm is represented by a single layer of flattened cells surrounding the yolk sac and amnion, and peripherally by an irregular layer beneath the trophoblast. The chorionic mesoderm eventually forms the connective tissue of the core of the chorionic villi. The division into ectoderm, mesoderm and endoderm is subsequent to the full development of an



FIG. 36 Same specimen, higher magnification, illustrating the structure of primitive chorionic villi and the appearance of the cytotrophoblast. A few pieces of syncytium can be seen around the cytotrophoblast.

amnion and yolk sac. The embryonic plate is represented originally by the adjacent cells of the amnion and yolk sac. The primitive streak arises early in development and almost simultaneously a cloacal membrane becomes differentiated at the caudal end of the primitive streak. Hensen's knot lies at the cranial end of the primitive streak and in front of the knot is the opening of the blastopore, leading to the chorda canal which passes through the mesoderm to open by several small apertures into the yolk sac. Cranially from the dorsal lip of the blastopore stretches the tissue which subsequently gives rise to the neural plate and neural folds.

The allantois develops early as a diverticulum from the yolk sac in the region of the cloacal membrane. Blood islands can be distinguished in the wall of the yolk sac very early in development and blood vessels pass along the course of the allantois to reach the trophoblast. The mesoderm of the embryo arises by the division of cells at the base of the primitive streak and the mesodermal layer stretches laterally between the ectoderm and the endoderm of the yolk sac. The connecting stalk contains a

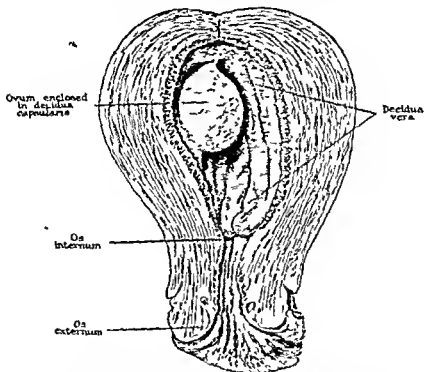


FIG. 37. Pregnant uterus with ovum of four weeks' gestation. Natural size. (Eden and Holland's "Obstetrics")

diverticulum of the amnion, the allantois and its blood vessels, together with primitive cells which resemble the cells of the chorionic mesoderm. Subsequently the connecting stalk becomes the umbilical cord.

The Trophoblast. At the time of implantation the trophoblast is represented by a single layer of cells. Implantation is interglandular, the ovum coming directly into contact with the smooth epithelium of the decidua: the subjacent epithelium and decidual tissues of the endometrium are eroded by fermenta-

tion and partly through its eroding action, and also perhaps through amoeboid movements the ovum lodges itself in the superficial compact layer of the decidua. The aperture in the decidua through which the ovum passes, the operculum, is closed by tissues which seem to consist partly of trophoblast and partly of decidua. Later in development decidual tissues grow over the operculum and form that part of the decidua of the pregnant uterus called decidua capsularis.



FIG. 28 Intra uterine pregnancy at about the 7th week To the right and above lies the ovum The shaggy villi are covered by decidua reflexa while the rest of the endometrium has been converted into decidua

The subsequent development of the trophoblast is not easy to understand, and the form of the trophoblast alters very considerably in the first few weeks of development. In the earliest stages the trophoblast is represented by irregular vacuolated cells with well-defined cell membrane called the cytotrophoblast. Later there is a rapid development of syncytium or plasmodi-trophoblast which consists of masses of deeply pigmented protoplasm of irregular shape, containing undifferentiated nuclear material. Still later there is further development of the cytotrophoblast, so that at the time chorionic villi are becoming

differentiated relatively little syncytium can be distinguished. There is very good reason to believe that in the early stages of development the cytotrophoblast comes directly into contact with the decidual tissues, so that at the periphery of the implanted ovum trophoblast and decidua are mixed together without a clearly defined line of cleavage.

CHAPTER III

PHYSIOLOGY

IN recent years much progress has been made in elucidating the physiology of reproduction in the human female. The influence of the ovaries upon the accessory organs of reproduction has for long been recognised, for the removal of the ovaries during the child bearing period of life leads to the cessation of menstruation and to atrophy of the uterus, vagina and vulva. The functions of the accessory organs of reproduction are therefore directly controlled by the ovaries. On the other hand, work on the anterior pituitary sex hormone has shown that the ovaries themselves are influenced by the pituitary, and there is good reason to believe that the dominant centre of sexual activity lies either in the pituitary itself or in the part of the brain in its immediate vicinity. Reproduction is one of the most primitive characters of biology—almost archaic in geological time dating at least from pre Cambrian times—so that its evolution has had ample opportunity to produce highly complex processes in man. Sex functions are by no means restricted to menstruation, pregnancy, lactation and the act of sexual intercourse. Darwin emphasised the existence of what he termed secondary sexual characters and the interpretation of these so called secondary sexual characters offers some of the most difficult problems in ovarian physiology.

Secondary Sexual Characters

It is customary to regard the secondary sexual characters of the human female as being exemplified by the character of the hair on the head, the layers of fat around the breasts and pelvis, the distribution of the pubic hair, the development of the breasts after puberty and the shape of the bony pelvis. It has been thought that these characters are induced by internal secretions from the ovaries, but there is reason to believe that their development is more complex. No authentic record is available of the effect of excision of the ovaries prior to puberty

in man, but removal of the ovaries during the child bearing period of life is not followed by retrogression of the so-called secondary sexual characters there is no alteration in the shape of the pelvis, in the character of the pubic hair or in the distribution of fat in the body It is therefore possible that such secondary sexual characters are not primarily controlled by the ovaries themselves, and evidence is accumulating that other ductless glands play an important part in their development It was shown by Pezard that the removal of the sex glands of birds led to the development of a neutral type, and at the present day it is believed that the secondary sexual characters represent alterations in the neutral type which are induced by the sex glands The interpretation is complicated because such features are not necessarily superimposed upon the characters of the neutral type in some cases the features of the neutral type are inhibited by the secretions of the sex glands In man the most important evidence of the neutral type has been obtained from work on the Skopeks a Slavonic religious sect who castrate their male children before puberty The adult Skopek, who probably represents the neutral type in man, has a distribution of fat around the breasts and hips similar to that which develops in adult women The pubic hair is of the feminine type, there is no growth of hair upon the face except a few scattered hairs similar to those seen in women past the age of the menopause, and the larynx retains the characters of a boy before puberty The most important result of the investigations on the Skopeks has been to show that such characters as pubic hair and the feminine distribution of fat around the hips and breasts are not induced by the secretions of the ovaries It seems much more probable that the human female approaches more to the neutral type than the male, and that only such characters as the shape of the female pelvis and the hypertrophy of the breasts seen after puberty are dominated by internal secretions from the ovaries There is clinical evidence in support of this view, for occasionally patients are seen who menstruate regularly and may even reproduce normally who have no pubic hair and whose breasts are ill-developed Autoplastic transplantation of the ovary affords very little evidence as to the influence of the ovaries upon the secondary sexual characters, for, as has already been pointed out, the removal of the ovaries after puberty does not lead to an inhibition of the so called secondary sexual characters Probably

(3) Œstrus or "heat," the stage in which mating takes place and when ovulation occurs. The ovaries are large and the uterus is more hypertrophied.

(4) Post-œstrus, during which, if pregnancy has not ensued, corpora lutea persist in the ovaries.

There is much variation in the œstrous cycle amongst different species, and in such animals as the rabbit and ferret clearly defined œstrous cycles are not distinguished and ovulation is brought about only by coitus. In these animals, if the buck has been previously vasectomised, coitus is still followed by ovulation with the subsequent formation of corpora lutea and the animal passes into a state of pseudopregnancy during which the breasts hypertrophy and the uterus proliferates. The characters of pseudopregnancy in the rabbit show clearly that the corpus luteum controls breast hypertrophy and induces proliferative changes in the uterus. In this way, the tenderness and swelling of the breasts, so frequently noticed by women before menstruation is due, can be explained. In most animals the mating occurring during œstrus leads to pregnancy so that the post-œstrous phase or the phase of pseudopregnancy must be investigated experimentally. Efforts were made by Heape and by later experimentalists to correlate the œstrous cycle of lower animals with the menstrual cycle of man and the primates. Heape believed that the pro œstrous bleeding of the bitch was homologous with menstrual bleeding, for at that time accurate data were not available as to the time relations between ovulation and menstruation. It is now clear that menstruation cannot be regarded as comparable to the pro œstrous bleeding of the bitch, for ovulation is restricted to the intermenstrual phase of the cycle. It has been pointed out in the previous chapter, however, that intense hyperæmia of the endometrium is frequent during the proliferative stage of the menstrual cycle, so that in some women intermenstrual bleeding develops, which is comparable in every way to the pro œstrous bleeding of the bitch. Similarly the secretory phase of the menstrual cycle can be regarded as homologous with post œstrus or pseudopregnancy of lower animals. Marshall and Hainan have shown that retrogressive changes can be demonstrated in the endometrium of lower animals at the end of pseudopregnancy although such retrogression does not give rise to uterine bleeding. Apart from the cyclical bleeding of certain primates, no form of uterine bleeding is known which is comparable to menstruation in the

human subject. A further difficulty is that a cyclical anovular uterine bleeding has been demonstrated by Corner in such monkeys as the Macaque, unassociated with ovulation and the formation of a corpus luteum and without premenstrual hypertrophy in the endometrium. In such cases degenerative changes develop in the mucous membrane of the uterus which closely resemble those found during normal menstruation. It seems, therefore, that menstrual degeneration of the endometrium is independent of ovulation and corpus luteum formation, and Hartman has suggested that cyclical degeneration of the endometrium is controlled by the pituitary and not by the ovaries.

Vaginal Smears In such animals as the mouse and rat the œstrous stage of the animal can be at once determined by examining vaginal smears. The characters found at the different stages of the œstrous cycle are as follows —

(1) *Di œstrus* The smear consists of leucocytes mixed with a few epithelial cells.

(2) *Pro œstrus* The lining cells of the vagina are undergoing hypertrophy so that the smear consists of nucleated epithelial cells together with a few leucocytes.

(3) *Œstrus* The smear consists of non nucleated epithelial cells alone.

(4) *Post œstrus* In this phase corpora lutea are present in the ovaries and the smear consists of non nucleated cells, but leucocytes are present as well.

(5) During pregnancy, in addition to non nucleated epithelial cells and leucocytes, relatively large quantities of mucus appear.

The Ovarian Hormone Œstrin

Allen and Doisy in 1922 succeeded in extracting an active preparation from the ovaries which was capable of inducing œstrus in castrated mice. The hormone is present in ripening Graafian follicles and in the corpus luteum, but it may be obtained from other sources as well. It is present in great concentration in the urine and faeces of pregnant women, in the liquor amnii and in the placenta. It has been extracted from male urine, and even from the testicle! Little is known as to the exact source of the hormone, although there is some evidence that it is produced by the theca interna cells of Graafian follicles. The

biological standardisation of oestrin is difficult, for animals vary in their response to the same preparations. The rat unit is regarded as the highest dilution of the preparation which, when given in three divided doses at intervals of four hours, produces oestrus in the castrated mature rat at the end of three days. The effect must be present in at least four out of five animals.

Biological Effects. The administration of oestrin induces the oestrous cycle in a castrated mouse or rat and the oestrous state of the animal can be recognised by an examination of vaginal smears. In addition, the uterus enlarges, but its hypertrophy is different from the nidatory hypertrophy seen during pseudopregnancy in the corpus luteum phase. It is possible to distinguish between oestrous hypertrophy and pseudopregnancy hypertrophy by histological examination of the mucous membrane of the uterus. It has been shown that a similar oestrous hypertrophy develops in the uterus of castrated monkeys after the administration of oestrin, and Zondek claims that similar effects can be demonstrated in the human female. The other biological effects of oestrin are obscure and difficult to explain. It has been shown that prolonged dosage of oestrin in immature animals is followed by failure of the ovaries to attain full development. Again, there is some evidence that large doses of oestrin inhibit conception in the rat, and with some animals if the hormone is injected in large quantities during pregnancy it leads to abortion. Lastly, the administration of large doses of oestrin is followed by hypertrophy of the breasts.

The oestrous producing hormone clearly has a profound biological effect upon those lower animals in which the oestrous cycle dominates sexual activity. In man and in the primates the oestrous cycle has not the same significance, for the corpus luteum phase has assumed much greater importance and a new factor, menstruation itself, has appeared.

The Ovarian Hormone Progesterin

The earliest work on the functions of the corpus luteum was that of Fraenkel, who showed that in the case of the rabbit abortion followed the removal of the corpus luteum in the early days of pregnancy. These results have subsequently been confirmed, but it is important to realise that the effect of the corpus luteum is restricted to the early part of

pregnancy. Evidence, both clinical and experimental, has accumulated, which shows that the corpus luteum can be removed later during pregnancy without resultant dislodgment of the implanted ovum. Further evidence as to the function of the corpus luteum was obtained by the work of Ancel and Bouin on pseudopregnancy in the rabbit, which showed that hypertrophy of the breasts was induced by the corpus luteum, and by Leo Loeb, who found that the formation of deciduomata in the endometrium of the rabbit was restricted to the time when a corpus luteum was present in the ovaries. The work of Pearl and Surface showed that extracts of the corpus luteum inhibited ovulation, a conclusion which had previously been put forward by gynaecologists as a result of study of the ovaries during pregnancy. In recent years much progress has been made. Brouha, Corner and Hisaw among others, have succeeded in obtaining an active principle from the corpus luteum termed *progestin*, having the following biological effects —

- (1) It inhibits ovulation in the rat, fowl and guinea pig
- (2) It induces a well marked nidatory hypertrophy of the endometrium in the normal animal
- (3) It has no effect upon the uterus of the castrated animal, but if in such animals the uterus is first sensitised by the administration of *œstrin*, the corpus luteum extract *progestin* produces a characteristic nidatory hypertrophy
- (4) The hormone *progestin* has an inhibitory effect on uterine contractions and the hormone counteracts the effect of *pitocin* on the isolated uterus of the guinea pig
- (5) Whereas there is good evidence that *œstrin* induces hypertrophy of the breasts, the hormone *progestin* produces no alteration in the breast tissue after injection

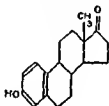
The view that the corpus luteum causes the premenstrual hypertrophy of the endometrium during the secretory phase of the human menstrual cycle is therefore corroborated by animal experiment. Moreover, the nidatory hypertrophy of the endometrium of lower animals subsequent to the administration of *progestin* is comparable in every way to the secretory hypertrophy of the endometrium during the human menstrual cycle. Thus far the interpretation of the cyclical alterations in the endometrium given in the previous chapter can be regarded as established by experiment. The failure of experimental work to demonstrate a relation between the hormone *progestin* and secretory activity of the breasts is the only discrepancy

CHEMISTRY OF THE SEX HORMONES

Up to this point the terms œstrin and progestin have been used for the ovarian hormones. Biochemical research has, however, succeeded in determining the chemical constitution of the active principles of the hormones and active substances have even been synthesised. Students have great difficulty with the terminology employed. They should use the words œstrin and progestin in a wide sense to indicate active animal extracts. The pure chemical substances deserve a nomenclature of their own.

Œstrogens Œstrogens are pure chemical substances which individually possess the biological properties of œstrin. Most of them are extracted from pregnancy urine.

Œstrone, $C_{18}H_{22}O_2$ has the constitutional formula



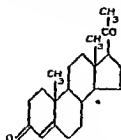
Œstradiol is its hydrogenation product. Other œstrogens are œstriol, equiline, equilenine and the œstranes. These chemical substances are derived from animal sources and as a general rule are prepared chemically from one or other basic substance, such as œstrone or equilenine.

It has been shown, however, that these œstrogens can be activated by esterisation. For example, œstradiol benzoate is far more active than œstradiol and more suitable for therapeutics because of its slower absorption. Œstradiol dipropionate is still more active.

The result of this chemical work has been to thrust a whole array of chemical substances upon the medical profession, and it is perhaps true to say that few medical men have the time or interest to study them closely. The confusion is greatly increased because each manufacturing firm uses its own particular terminology. At the moment the number of differently named products of the ovarian sex hormones which are marketed by the commercial firms is appallingly great. Students are advised to consider their theoretical work in terms of the

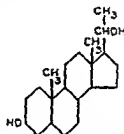
hormones, œstrin, progestin, etc. When therapy is required, they should use the preparations of some particular firm and not change repeatedly from one firm to another.

Progesterone, $C_{21}H_{30}O_2$, has the structural formula



and is clearly closely related to the œstrogens

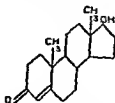
Pregnandiol, $C_{21}H_{32}O_2$,



is an inactive excretion product of progesterone which can be extracted from the urine when the corpus luteum is functioning. It can be obtained in the crystalline state and weighed. In this way the function of the corpus luteum can be determined with fair accuracy.

Synthetic Œstrogens The brilliant work of Dodds and his co-workers has led to the preparation of synthetic œstrogens. Of these, stilbœstrol is the best known, but others such as hexœstrol have been prepared. It is probable that new and more active preparations will be synthesised in due course. Stilbœstrol is more active when taken by mouth than are the natural œstrogens and it compares favourably with the natural substances in its clinical and biological properties. At the present time there is a tendency to employ œstrin therapy by means of the administration of stilbœstrol by mouth. When large doses of œstrin are required the preparation should always be given by injection. Large doses of stilbœstrol when given orally frequently produce nausea and vomiting.

The Male Sex Hormones

Testosterone, $C_{19}H_{28}O_2$ 

is derived from the testis and can be prepared artificially from cholesterol. The resemblance of its structural formula to that of the oestrogens should be noticed.

Its excretion product is androsterone, which is obtained from male urine. A large number of other androgens are known. The same remarks apply to these substances as were made upon the ovarian hormones. Different esters are marketed and each commercial firm uses its own nomenclature.

Dosages of the Ovarian Hormones

Oestrin The Mouse Unit is the standard biological unit.

The International Benzoate Unit, which is equivalent to 1 mgm of oestradiol benzoate, corresponds to the Mouse Unit.

The International Unit is contained in 1 mgm of oestrone. Its strength is only one fifth of the I B U.

Progesterin Formerly the clinical unit and the rabbit unit were used. These are now obsolete and have been replaced by the International Unit which is represented by 1 mgm of progesterone.

The Hormones of the Pituitary Gland

The pituitary gland is divided anatomically into the anterior lobe, the pars intermedia and the posterior lobe. The anterior lobe contains two main types of cell, the chromophil and the chromophobe. The chromophil cells are either basophil or acidophil. The chromophobe cells or "hauptzellen" stain feebly, whereas the other types stain deeply. The pars intermedia consists of epithelial cells which penetrate into the posterior lobe, while the posterior lobe itself consists mainly of connective tissues and neuroglia. The physiology of the pituitary body is highly complex, and it is remarkable that so many functions are exerted by this small gland.

The influence of the pituitary gland upon the generative organs has been known for many years for there are remarkable diseases caused by tumours of the pituitary which have a profound effect upon sex functions

Acromegaly is a disease associated with a hyperplastic condition of the acidophil cells of the anterior lobe. These cells are believed to secrete the hormone, which, when injected into animals, produces gigantism. Acromegaly is usually associated with disturbances of function of the other ductless glands frequently there is an increase in the thickness of the suprarenal cortex, usually the thymus is enlarged, associated colloid goitre is not uncommon, derangement of the islets of Langerhans may lead to glycosuria, while in the late stages of the disease amenorrhœa is the rule. Frölich's syndrome, or dystrophia adiposogenitalis, is believed to be due to derangement of function of the chromophobe cells of the anterior lobe. In women, enormous deposits of fat form around the hips, abdomen and breasts, while the genitalia are ill developed so that amenorrhœa and sterility result. Pituitary infantilism. In this form of infantilism there is well marked ill development of the genitalia, together with an arrest of body growth. Such patients show none of the so called secondary sexual characters. There is no growth of pubic hair and the breasts remain ill developed.

It has been known for many years that the removal of the pituitary body in animals is followed by atrophy of the genitalia, but it was not until 1921 that active extracts of the anterior lobe of the pituitary were obtained. In that year Long and Evans found that saline extracts of the anterior pituitary gland produced well marked body growth when injected into adult animals. In 1927, almost simultaneously, Smith and Lingle, and Zondek and Aschheim demonstrated the presence of a sex hormone in the anterior lobe. The anterior pituitary sex hormone, when injected into immature animals, produces growth of the follicle system so that Graafian follicles ripen, some of the follicles ovulate, while in others corpora lutea are produced without the ovum being discharged from the follicle. As the result of the ovarian activity thereby induced the immature animals pass into a state of œstrus which can be demonstrated by an examination of vaginal smears. Zondek and others believe that two factors are present in the gonadotropic hormone of the anterior pituitary, one which is follicularising or œstrogenic, the other which is luteinising and

causes luteinisation of the granulosa cells of the follicles. The evidence of the existence of these two factors is inconclusive, and it seems more than probable that the different effects produced depend upon the amount of the hormone injected, rather than upon intrinsic differences in the preparations.

Zondek subsequently demonstrated similar gonadotropic principles in the urine of pregnant women and in the placenta, and the names prolan A and prolan B are given by him to the oestrogenic and luteinising principles respectively. The presence of these prolan substances in the urine forms the basis of the Zondek Aschheim pregnancy test. Erdheim and others showed many years ago that the anterior lobe of the pituitary hypertrophies during pregnancy, and it is now believed that the gonadotropic pituitary hormone is secreted in large amount during pregnancy, the excess being excreted in the urine. The Zondek Aschheim test depends upon the demonstration of corpora lutea and atretic follicles in the ovaries of immature mice after intraperitoneal injection of the specimen of urine under consideration. There is some evidence that the gonadotropic substances found in the urine during pregnancy are chemically different from the hormone extracted from the fresh anterior lobe, but as yet there is little information available as to the chemical properties of the hormone.

In addition to the growth promoting and the gonadotropic hormones of the anterior lobe, a third hormone which induces hypertrophy of the breasts has been extracted by Corner. This lactogenic principle produces activity in the breasts of mature castrated female rabbits.

Other hormones have now been identified but they are probably of little importance in gynaecology. There is a thyrotropic hormone which stimulates the thyroid to increase its secretion, an adrenotropic hormone which stimulates the suprarenal cortex and a parathyroidotropic hormone. In addition there is a diabetogenic hormone which consists of a blood sugar raising factor together with a ketogenic principle. Lastly there is a pancreatotropic hormone which depresses the blood sugar and depletes the liver glycogen, the hormone having no effect after the removal of the pancreas.

The meaning of this formidable array of hormones can only be that they are essentially very similar chemically and that their different and specific effects depend upon minor changes in the basic molecule from which they are derived.

The pituitary sex hormones clearly dominate ovarian activity in lower animals, and there is much experimental work which upholds this view apart from the evidence mentioned above. The control of ovarian activity by the pituitary in the case of

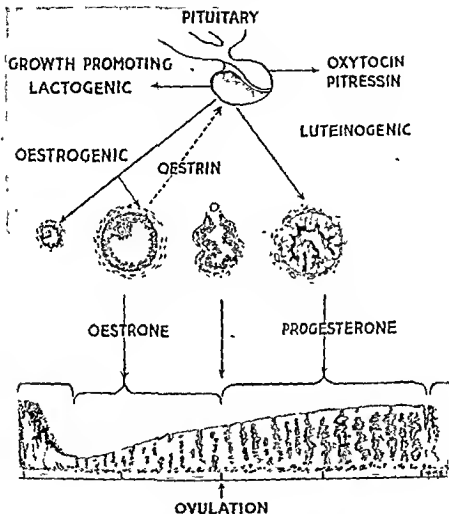


Fig. 40. The hormone control of the menstrual functions. (After Graves.)

lower animals leads to the belief that potent extracts of the anterior pituitary gland should be useful therapeutically for the treatment of ovarian disorders in the human subject. Clinical work is as yet only in the preliminary stage. Perhaps the menstrual cycle in human beings represents a stage in evolution

beyond that where the pituitary was all important in the control of sexual activities

- The Posterior Pituitary Lobe

The hormones obtained in extracts of the posterior pituitary glands are probably secreted by the cells of the pars intermedia. The pressor principle produces a sustained rise of the arterial blood pressure, while the oxytocic principle has a specific effect in causing contractions of the uterus. A third principle is antidiuretic and is of service in treating cases of diabetes insipidus. In addition to these three principles it has been shown that the posterior lobe of the pituitary influences both carbohydrate and fat metabolism. The pituitary hormones can therefore be grouped as follows —

Anterior Pituitary

- (1) Growth promoting hormone
- (2) Gonadotropic with possible subdivision into —
 - (a) Oestrogenic
 - (b) Luteinising
- (3) Lactogenic
- (4) Thyrotropic
- (5) Adrenotropic
- (6) Parathyroidotropic
- (7) Diabetogenic
- (8) Pancreatotropic

Posterior Pituitary

- (1) Oxytocic
- (2) Pressor
- (3) Antidiuretic

Antihormones

It was shown originally by Anderson and Collip that the blood serum of an animal chronically treated with thyrotropic extract developed an antithyrotropic hormone which protects other animals from the effect of the extract. An antagonodotropic hormone has since been recognised. As yet, owing to difficulty

in obtaining requisite supplies of the antigonadotropic hormone little can be said of its clinical properties. Nevertheless, in theory, antihormones must be of the greatest significance. In the first place it is possible that hyperfunction can be treated by immunising patients passively against their own hormones and secondly, if the antigonadotropic hormone is available in therapeutic doses, it may be injected directly for the treatment of hyperfunction of the sex glands.

The Thyroid Gland

There is no reason to believe that the thyroid gland affects the generative system of the healthy individual. On the other hand, in cases of thyroid disease, menstrual disturbances are frequent. In exophthalmic goitre it is common for patients in the advanced stages of the disease to develop amenorrhœa. In myxœdema, menorrhagia and frequent menstruation are not uncommon, while in cretinism, menstruation, if it appears at all, is usually delayed.

Enlargement of the thyroid during pregnancy has been described since the time of Hippocrates, the most marked enlargement is seen in cases of colloid goitre.

The Parathyroid Glands

As in the case of the thyroid, there is no reason to believe that the parathyroid glands exercise a direct influence over the female generative organs. On the other hand, in cases of tetany during pregnancy, there is good reason to believe that the condition is due to lesions of the parathyroid. Similarly the spasm of the muscles of the legs so often complained of in the latter part of pregnancy is probably related to this form of tetany. Again, the dental troubles so common in early pregnancy are almost certainly due to calcium deficiency. In osteomalacia, so frequently arising during pregnancy, lesions of the parathyroid glands suggestive of an increase in function are found associated with hyperplasia of the ovaries.

The Thymus

Very little is known of the functions of the thymus. Temesvary claims that extracts of thymus stimulate contractions of the

isolated uterus There is also some experimental evidence to show that removal of the thymus induces sexual maturity in young animals

The Placal Body

There is reason to believe that tumours of the pineal body produce precocious puberty, but such tumours are usually teratomatous in type and are not composed of the normal tissues of the gland It has been suggested that the pineal gland secretes a sex inhibitory hormone, but the evidence in support of this view is very slender

The Pancreas

In severe cases of diabetes it is almost the rule for the patients to develop amenorrhœa Sterility, impotence and atrophy of the genitalia are frequently associated with the disease In cases of pregnancy complicating diabetes there is a tendency to abortion, and, prior to the introduction of insulin, the majority of patients with diabetes who became pregnant died in coma It should be remembered, however, that such cases of pregnancy complicating diabetes were rare, as the majority of patients with diabetes are sterile

The Suprarenal Glands

The suprarenal gland is divided into a cortex and medulla, and the hormone adrenalin can readily be extracted from the medulla There are well known relations between adrenalin and the hormones of the pancreas, thyroid and parathyroid glands The suprarenal cortex is essential to life and there is evidence that extracts of fresh suprarenal cortex lead to a rapid development of the generative organs Hartman calls the active principle of these extracts cortin

It is well known that tumours of the suprarenal gland arising in children lead to precocious puberty In adult females rare tumours of the suprarenal cortex develop which produce virilism The tumours lead to amenorrhœa, atrophy of the uterus and breasts, to hypertrophy of the clitoris, and to a masculine distribution of hair These tumours are rare, but it is well established that the masculine characters retrogress after their removal

Summary

In consequence of the experimental work on the sex hormones, it is possible to interpret to some degree the factors which control the menstrual cycle in the human subject.

The proliferative phase of the endometrium clearly represents the œstrogenic part of the menstrual cycle, and it is more than probable that the source of the œstrin is the ripening Graafian follicles in the ovary. A critical survey of the work on the hormone œstrin might very well lead to the conclusion that the evidence is slender that the sole source of the œstrin was the Graafian follicle, but whatever the source, it is clear that the proliferative phase is homologous with the pro-œstrous phase of lower animals. Similarly, the secretory phase of the endometrium corresponds to the pseudopregnancy of the rabbit and ferret, and the specific

changes in the endometrium represent the effect of progestin upon an endometrium previously sensitised with œstrin during its phase of proliferation.

The experimental work on the hormones of the pituitary gland shows that ovarian function can be controlled from the pituitary, and it is more than probable that the pituitary gland

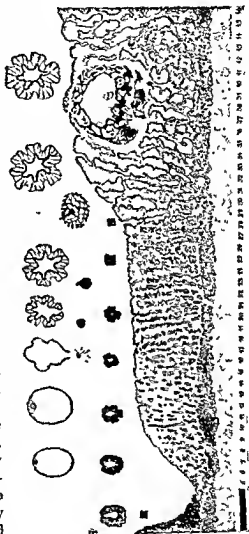


FIG. 41. Schröder's illustration of the relation between ovarian function and the changes in the endometrium during early pregnancy. (Velt-Stoerkel.)

dominates sexual activity in lower animals. The clinical evidence obtained from such conditions as acromegaly and Fröhlich's syndrome shows conclusively that diseases of the pituitary gland may be followed by well marked disturbances in ovarian activity. On the other hand, it is possible that the influence of the pituitary on the menstrual cycles of women is not so profound as its effect upon the oestrous cycles of lower animals.

As regards the secondary sexual characters of the human female, it is becoming more and more clear that the majority of these characters are those of the neutral type. Such conditions as pituitary infantilism in which there is no growth of pubic hair, no development of the breasts, and no deposition of fat around the breasts and hips, indicate that these characters are more probably controlled from the pituitary than from the ovaries. Again, clinical evidence shows that the distribution of hair can be profoundly influenced by the suprarenal. It is more than probable, therefore, that the characters of the neutral type are not determined by the ovaries, and that only such specific sexual characters as hypertrophy of the breasts and the shape of the pelvis are under the influence of the ovaries.

In the last few years intense research has been carried out on the ovarian hormones in the hope that menstruation may be produced experimentally. The results can be summarised as follows. Large doses of oestrone administered to the intact animal produce bleeding comparable to the pro oestrous bleeding of the bitch and similar results are obtained in the human subject under certain conditions. Next, "withdrawal bleeding" can be produced as follows. The removal of both ovaries from a healthy monkey is followed by uterine bleeding. If oestrone is now administered to the castrated monkey its discontinuance will also cause bleeding. Progesterone given even in small doses inhibits natural menstruation in monkeys and in addition—which is most important—prevents oestrone withdrawal bleeding. There is a similar progesterone withdrawal bleeding to oestrone withdrawal. One of the most interesting results is that if oestrone and progesterone are given simultaneously, progesterone withdrawal is followed by uterine bleeding in spite of the continuance of oestrone administration. These experiments imply that the cause of menstrual bleeding is progesterone withdrawal and that anovular bleeding is due to oestrone withdrawal. The problem is perhaps not quite so

simple as this. The experiments offer, however, an explanation of some of the results obtained from the clinical administration of these hormones.

MENSTRUATION

The Menstrual Rhythm The menstrual cycle is usually one of twenty eight days, measured by the time between the first day of one period and the first day of the next. The duration of the hæmorrhage varies between three and five days, and the amount of blood lost has been estimated to be between 50 and 100 gm. An exact cycle of twenty eight days is present only in a small proportion of healthy women. Frequently there is a departure of two or three days from the twenty eight day rhythm while in other cases the cycle is one of twenty one days. In some women the menstrual cycle is irregular, varying between three weeks and six weeks, and such irregularity may be present without any sign of ill development of the genitalia. The cause of the normal menstrual rhythm of twenty eight days is unknown. The rhythm may conveniently be regarded as one of the biological constants of adult women, just as the pulse rate is constant at 72 beats per minute. Variations are found in different races, a shorter cycle being more prevalent amongst the women of tropical climates, while at the other extreme are the Esquimaux women who menstruate only during the time of the midnight sun.

Whatever its origin, it is now established that the rhythm is altered in gynæcological complaints only by disorders of the ovaries or of those ductless glands which influence the ovaries through their internal secretions. One of the most important results of recent gynæcological researches has been to demonstrate conclusively that the menstrual rhythm cannot be influenced by disease of the uterus or the Fallopian tubes. These results apply only to the menstrual rhythm, for the amount of blood lost and the duration of the hæmorrhage at a menstrual period are commonly affected by local abnormalities of the uterus and Fallopian tubes.

Characters of the Menstrual Discharge The menstrual discharge consists of dark altered blood mixed with mucous secretion from the cervical canal and with the normal vaginal secretion. The dark fluid blood has a characteristic appearance. It is different from the uterine hæmorrhage of cases of carcinoma.

of the body of the uterus or from the hemorrhage of polypi or of abortion, but the same type of dark fluid blood is seen in cases of metropathia hemorrhagica. In normal menstruation the blood does not clot owing to the presence of a tryptic ferment secreted by the glands of the body of the uterus which destroys the fibrinogen of the blood. Clots are passed if menstrual bleeding is excessive, and the passage of clots is a symptom met with in cases of myomata and of excessive hemorrhage. If the menstrual discharge is examined on the first day of the period of bleeding, relics of the functional layer of the endometrium can be detected.

Symptoms

During menstruation most women 84 per cent., suffer from minor disturbances which upset the general health. The commonest of these is a heavy feeling in the lower abdomen and back, which is similar to the pain of abortion, though not so severe, and is caused by the contractions of the uterus during the extrusion of the menstrual discharge. A heavy feeling in the lower abdomen often develops before the menstrual period begins, and is attributed to the vascularity of the uterus during the late premenstrual stage. As a result of the pelvic hyperæmia, frequency of micturition and a feeling of fullness in the pelvis are often noticed, and it is not uncommon for any hemorrhoids which may be present to become more painful. Moreover, headaches, sleeplessness, palpitations and even migraine are common, and such psychical disturbances as depression and irritability frequently develop. In some cases there is slight enlargement of the thyroid gland, and often the nasal mucosa becomes congested. It is stated that a similar swelling arises in the vocal chords. Sometimes skin eruptions, such as acne, urticaria and herpes, develop during menstruation. In past years these affections were attributed to a menstrual toxin, and there are fables that flowers and foliage held in the hands of menstruating women rapidly fade. At the present day it is customary to treat these skin conditions with ointments such as *Æstroglandol* which contain the hormone *œstrin*, and good results have been reported. Immediately before menstruation the blood pressure rises, as does the basal metabolic rate, and at this time also the number of red blood corpuscles in the blood increases and the calcium content of the blood is raised.

Intermenstrual Pain *Mittelschmerz* In some women severe

pain is felt in the lower abdomen half way between two periods on about the fourteenth day of the cycle. This intermenstrual pain has been attributed to the rupture of a Graafian follicle during ovulation. In most cases the pain is restricted to about the fourteenth day, frequently the vaginal discharge is increased at the time, and in some cases there is a little bleeding as well. Intermenstrual pain is probably caused by tension within ovaries which have a sclerosed tunica albuginea, for at about the time of ovulation the ovary contains either a large ripening follicle or a vascular proliferating corpus luteum. In some cases the intermenstrual pain is so severe that sedatives have to be given. Operations have been performed in which wedges are excised from the cortex of the ovary in the hope that the pain will be relieved. The results of such treatment are indefinite, and the operation should never be advised unless all conservative methods of treatment have failed.

PUBERTY

The menstrual periods begin at puberty and simultaneously the sex characters of the individual become more marked. The breasts hypertrophy, and there is growth of hair on the mons veneris, the labia majora, and in the axillæ. The usual age of onset is between 13 and 15, but there is considerable variation amongst different races, the age of onset being earlier in southern countries. In Egypt and Spain menstruation begins between the ages of 10 and 12, while amongst the Esquimaux the average age of puberty is 23. Similarly, puberty is delayed amongst the agrarian people of the Balkans, where the children have to work strenuously for long periods in the open air. Amongst such people it is a common custom for the young girls to be impregnated before marriage, for there is no other simple method available to determine whether the individual is fertile. The effect of hard manual work upon menstruation is seen in this country, for it is common for young people to cease menstruating if they change their environment and work strenuously for long hours.

THE MENOPAUSE

The menopause occurs between the ages of 45 and 50, the average age of onset is 47, so that the child bearing period of life covers a period between thirty and thirty five years. T

variations in the time of onset amongst individual races, and the earlier the onset of puberty the later does the menopause develop. A late onset of the menopause is frequently associated with the presence of uterine myomata or of some degree of myohyperplasia. In some women menstruation ceases abruptly during the third decade of life without producing any severe disturbances of the general health. After the menopause ovarian activity ceases, and ripening follicles and corpora lutea no longer develop in the ovaries. The interstitial cells remain for a few months, but within a year of the completion of the menopause ovarian activity has ceased and even primordial follicles have disappeared. As the result of cessation of ovarian activity, reactions develop in the other ductless glands which are responsible for many of the menopausal symptoms which arise.

Locally the genitalia undergo atrophy and retrogression. The ovaries become shrunken and their surfaces grooved and furrowed. The plain muscle of the Fallopian tube undergoes atrophy, cilia disappear from the tubal epithelium and the tubal plicæ are not so prominent. The uterus becomes smaller through atrophy of its plain muscle, so that the connective tissues are relatively more conspicuous when sections are made through the myometrium. The endometrium is represented only by the basal layer with its compact deeply staining stroma, and by a few simple tubular glands. The functional layer can no longer be demonstrated, premenstrual hypertrophy is never seen, and the lymphnodes also disappear. It is common for some of the glands of the endometrium of the body of the uterus to become cystically dilated even before menstruation has ceased and such cystic glands are usually to be demonstrated in the endometrium after the menopause. The cervix becomes smaller and its vaginal portion is represented in old women by a small prominence in the upper part of the vagina. The vagina becomes smaller and tends to be conical with the apex of the cone in the situation of the cervix. The vaginal epithelium becomes pale and dry, and during its involution is readily infected, so that the condition colpitis senilis results. The vulva atrophies and the vaginal orifice becomes smaller, so that dyspareunia is a common symptom. The skin of the labia minora and of the vestibule becomes pale and dry, and there is a reduction in the amount of fat contained by the labia majora. The pubic hair is reduced in amount and becomes grey. During

involution of the skin around the vaginal orifice and urethra the epithelium loses its resistance to infection, so that red granulating areas are often seen in these situations in patients past menopausal age. The pelvic cellular tissues become lax and the ligaments which support the uterus lose their tone, so that there is a tendency for the uterus to become retroflexed and particularly for prolapse to become more marked. It is well known clinically that patients quite often seek treatment for prolapse shortly after the menopause.

In addition to local atrophy of the generative organs, general disturbances develop which are almost certainly caused by alteration of the endocrine balance, which was maintained during the child bearing period of life. Fat is deposited around the breasts, hips, nates, and abdomen. Although the mammary glands atrophy, the deposition of fat frequently makes the breasts more pendulous. The skin becomes wrinkled and quite commonly hair grows round the lips and chin. In most cases the blood pressure rises, and cardiac irregularity and tachycardia are sometimes complained of. Again, arthritic changes often develop in the joints.

The commonest and most noticeable symptoms are hot flushings and sweatings. The flushings are waves of vasodilatation affecting the face and neck which last for about ten to fifteen minutes and are frequently followed by severe sweating. Digestive disturbances, such as discomfort and fullness after meals and constipation, are common symptoms.

Paresthesiæ, which take the form of sensations of pins and needles in the extremities, are again extremely common. Head aches and noises in the ears are often complained of, while psychical disturbances which take the form of irritability, depression and even melancholia are frequent. Sexual feeling is quite often increased when the menopause is in progress, and is probably induced by an irregular development of follicles in the ovary before menstruation finally ceases.

The condition pseudocyesis is not infrequent. Patients who are probably disturbed psychically attribute the amenorrhœa to pregnancy, a view which is supported by the increase in the abdominal girth caused by the deposition of fat. It is often difficult to convince such a woman that her symptoms are menopausal.

There is much variation in the manner in which the menstrual periods cease at the time of the menopause. Only three varia

tions should be regarded as physiological. First, the periods may suddenly stop and never recur. Secondly, the periods may occur rhythmically as before, the amount of blood lost being reduced at each successive period until no blood is lost at all. Thirdly, the menstrual cycle may be drawn out so that menstrual hæmorrhages occur at intervals of two, four or six months, and finally do not return. Any departure from these three forms should be regarded as pathological. It is a common misconception that irregular and excessive uterine hæmorrhage is a characteristic symptom of the menopause. Even to this day cases of carcinoma of the cervix are missed in their early stages because the irregular hæmorrhage caused by the carcinoma is regarded as menopausal. Any form of irregular hæmorrhage arising in women of menopausal age should be investigated with the utmost care. Vaginal examination must be insisted upon and a speculum examination should be made in all suspect cases. In cases of doubt there should be no hesitation in examining pieces of the cervix microscopically, and the uterus should be curetted and the curettings examined if there is any suspicion of carcinoma of the body of the uterus. One of the worst mistakes ever made in gynæcology is to fail to diagnose carcinoma of the uterus when the growth is at an early stage of development.

Apart from carcinoma of the uterus, other gynæcological conditions, such as myomata, polypi, etc., give rise to irregular hæmorrhage which very often can be easily treated and cured. All patients who suffer from irregular hæmorrhage at the time of the menopause should therefore be carefully examined to determine what the cause of this irregularity happens to be.

Treatment of Menopausal Symptoms. Most patients with severe menopausal symptoms are psychically disturbed, and such patients are not satisfied by simple pills and medicines. Attention should first be paid to the general health—careful dieting and open air exercise should be recommended. The cause of the symptoms should be explained to the patient and encouragement should be given by emphasising that the symptoms are not likely to last for long, and if malignant disease has been excluded this point should be emphasised very strongly. The old-fashioned remedy of giving a gentian and rhubarb mixture combined with thyroid is suitable for the average case.

It has been shown in recent years that the common menopausal symptoms of flushings, irritability and depressions are cured

almost specifically by the administration of α strin (see Chap. XVI, p. 353). It is usual to give the hormone in the form of tablets of stilboestrol by mouth. Overdosage is to be avoided, otherwise patients complain of headaches. The hormone is of the very greatest value and is strongly recommended for patients with severe menopausal symptoms.

In view of the psychological disturbances, such stimulants as alcohol and coffee are contra-indicated.

CHAPTER IV

GYNÆCOLOGICAL DIAGNOSIS

INTRODUCTION

It is often difficult in gynecological practice to obtain an accurate history from the patient. Some women dislike discussing even normal menstruation with their medical attendant, and much diplomacy may be necessary to discover exactly what the patient is complaining of. Quite often there is difficulty with terminology, for the average patient has small knowledge of normal menstruation. Again some women have a curious reluctance to admit such symptoms as excessive hæmorrhage, continuous bleeding or discharge, and are easily distressed when leading questions are put with too much frankness. In some cases of dyspareunia and sterility it may be almost impossible to determine exactly what complaint the patient has, unless the question is approached very tactfully by roundabout means. First endeavours should therefore be directed towards gaining the patient's confidence, details in the history can conveniently be left for later.

Probably in no other branch of medicine is an accurate history more essential for diagnosis than in gynecology. In cases of disturbances of menstruation it is necessary to obtain the exact dates of the menstrual irregularities and much time has to be spent in obtaining such accurate records. A good plan is to have a calendar available when the history is being taken and at some clinics calendars are incorporated in the patients' notes. It is impossible to be exact in gynecological diagnosis unless accurate histories of this kind have been carefully considered. On the other hand, if an accurate gynecological history is available a large number of gynecological affections can be suspected and in some cases diagnosed from the history alone. Time spent on the patient's history is never wasted. Experience shows that mistakes in diagnosis are as often due to inaccurate anamnesis as to omission to elicit physical signs. The history should be taken systematically and questions

should be asked according to a strict routine. Unless every point in the history is investigated, errors in diagnosis will be made and failures to diagnose coincident abnormalities must crop up from time to time.

It is well to start the anamnesis by asking the patient to describe what she is complaining of and to allow her to state in her own words what type of pain and what irregularity of menstruation may be present. It is during this preliminary survey of the patient's symptoms that efforts are made to obtain the patient's confidence and to put her at her ease. If menstrual irregularities are complained of, it will usually be found that patients become confused in recalling dates, so it is easy to find an opportunity to turn to the next part of the interrogation when the menstrual history is examined in detail.

Menstrual History

(1) The patient should be asked at what age the menstrual periods began. A late onset of puberty is characteristic of hypoplasia genitalis and of ill development of the uterus. An early onset of puberty suggests undue activity of the ovaries, and later in life such patients frequently suffer from excessive menstrual bleeding.

(2) The normal menstrual rhythm. The menstrual cycle is often irregular during the few years subsequent to puberty, but at about the age of 17 or 18 the normal cycle for the individual becomes established. It should be borne in mind that the menstrual cycle is the time intervening between the first day of one period and the first day of the next. When a patient states that she menstruates every month she does not necessarily mean that the menstrual cycle is twenty-eight days, she may mean that the interval between the last day of one period and the first day of the next is twenty-eight days. Unless the normal menstrual cycle, as distinct from the interval between periods, is taken as the basis, confusion is almost certain to follow. For example, in cases of myomata the duration of menstruation is usually prolonged, so that the interval between the menstrual periods is reduced and the patient may complain that she menstruates more frequently than before, when actually the menstrual cycle itself is unaltered. Similarly, it will often be found, if patients are questioned closely, that there has been a variation of a few days from the cycle of twenty-eight days.

during the patient's normal catamenia, and even a difference of as little as one or two days may be of importance in the history when such conditions as ectopic gestation are being considered. The term menorrhagia is used for those cases in which the menstrual cycle is unaltered but in which the duration of the menstrual bleeding is prolonged. Polymenorrhœa refers to those cases in which a previous cycle of twenty-eight days is shortened to one of about twenty one days and subsequently remains constant at that rhythm. Polymenorrhœa arises very frequently after child birth and is a common symptom in patients who are approaching menopausal age.

(3) The amount of blood lost during each period is often difficult to assess. Clinical experience shows that a loss which one woman would call excessive is regarded by others as normal, and the number of diapers used may be misleading, for obviously there are variations in individual cleanliness. The passage of clots always means that the menstrual hæmorrhage is excessive. An excessive menstrual period leaves the patient tired and listless, so that in all cases in which severe bleeding is suspected, enquiries should be made as to the patient's general condition at the completion of the menstrual period. Simple menorrhagia is characteristic of myomata, myohyperplasia and inflammatory lesions of the ovaries and Fallopian tubes. In cases of hypoplasia genitalis very little blood is lost and scanty menstruation is also a symptom of such ductless gland disturbances as Frolich's syndrome.

(4) The date of the last normal period should always be recorded, and it should be regarded as the period prior to the onset of such abnormalities as polymenorrhœa, menorrhagia and continuous hæmorrhage. The date of the last uterine hæmorrhage, as distinct from the last normal period, should also be recorded and particular emphasis should be placed on dating the first day of this period with precision. Such details in the history are essential in the investigation of cases of suspected ectopic gestation and abortion.

Menstrual Abnormalities Hæmorrhages

Menorrhagia Menorrhagia is a symptom of some underlying abnormality which may be situated either locally in the uterus or ovaries or may be caused by some general disturbance—usually of the ductless glands—which reacts upon the genitalia.

In menorrhagia the duration of the menstrual bleeding is prolonged, the amount of blood lost on each day is increased so that clots are usually passed, but the menstrual cycle remains unaltered. The degree of menorrhagia is determined objectively by examination of the mucous membranes and by estimation of the hæmoglobin content of the blood. Such local abnormalities as uterine myomata, myohyperplasia and oophoritis lead to menorrhagia (see also p. 832).

Polymenorrhœa In polymenorrhœa the menstrual cycle is reduced so that the patient menstruates with a cycle which is less than that of the previous normal menstruation. In many cases of polymenorrhœa the amount of blood lost during each menstrual hæmorrhage is excessive. Polymenorrhœa arises frequently after child birth it is a common symptom in cases of myomata and is seen frequently in women of menopausal age.

Métrorrhagia In cases of métrorrhagia the menstrual cycle remains unaltered, but superimposed upon the normal menstrual bleeding is an irregular hæmorrhage which is intermenstrual in type. Métrorrhagia is a symptom of uterine polypi and of carcinoma of the cervix. The cause of métrorrhagia always lies locally in the pelvis.

Continuous Bleeding Some patients suffer from continuous uterine hæmorrhage so that the normal cyclical bleeding can no longer be distinguished. Continuous bleeding of this kind is met with in cases of abortion, ectopic gestation, carcinoma of the cervix, metropathia hæmorrhagica and in some cases of uterine polypi. With abortion there is a history of missed periods followed by excessive bleeding. In cases of ectopic gestation the vaginal bleeding is small in amount and usually consists of dark altered blood. In most cases of ectopic gestation the hæmorrhage starts about six weeks after the last normal period and invariably the patients give a history of severe abdominal pain. With metropathia hæmorrhagica there is usually a history of a missed period, the hæmorrhage is again small in amount, although, if continuing for a long time, it may lead to a severe degree of anæmia. There is, however, no history of abdominal pain in such cases. With carcinoma of the cervix the continuous hæmorrhage is always accompanied by an offensive discharge.

Pregnancy Hæmorrhages It is important to distinguish between the hæmorrhages associated with pregnancy and the hæmorrhages caused by purely local gynecological abnormali-

ties The hæmorrhages of early pregnancy should always be borne in mind when cases of irregular hæmorrhage are being investigated The hæmorrhages of early pregnancy are as follows —

(a) It is not uncommon for patients to have slight vaginal bleeding in the first few months of pregnancy at times corresponding to the suppressed periods

(b) All types of abortion may lead to irregular uterine bleeding

(c) In cases of ectopic gestation uterine bleeding is almost invariable

(d) Irregular hæmorrhage is seen in cases of hydatidiform mole

Later in pregnancy the hæmorrhages of miscarriage and ante partum hæmorrhage have to be considered It should also be borne in mind that such conditions as mucous polypi, vascular erosions and carcinoma of the cervix may be coincident with pregnancy and cause irregular hæmorrhage

Vaginal Discharges

In healthy women the vagina contains coagulated secretion and desquamated epithelial cells It is common for this normal secretion to be increased immediately prior to menstruation and during pregnancy The term leucorrhœa should be restricted to a simple increase in the normal vaginal secretion, but nowadays the word is used to describe any white vaginal discharge of a non purulent nature

A white vaginal discharge is common at puberty, during pregnancy and at the time of the menopause It is seen frequently in patients who are anæmic and constipated, who live sedentary lives and have little exercise in the open air Discharge of this kind is common in patients suffering from such chronic diseases as arthritis, chronic nephritis, tuberculosis and Hodgkin's disease A somewhat similar discharge develops in cases of mucous polypi of the cervix, of glandular erosions of the cervix and in cases of myomata in which the cavity of the uterus is enlarged

A profuse yellow discharge causing irritation and soreness at the vulva is seen in cases of trichomona infections of the vagina and in cases of acute vaginitis In acute gonorrhœa the discharge is often greenish in colour and causes soreness and

tenderness at the vulva. Purulent discharges of this kind are seen in septic abortion and puerperal sepsis in cases of pyometra, and after evacuation of pelvic abscesses into the vagina.

Offensive vaginal discharge is characteristic of carcinoma of the cervix, of septic myomatous polypi, of septic abortion and of the rarer growths such as sarcoma of the uterus and carcinoma of the vagina.

Bloodstained discharges arise in colpitis senilis, carcinoma of the cervix, carcinoma of the body of the uterus, polypi of the uterus, and with the rare growths of the uterus and vagina.

In all cases of discharge, the possibility of intra uterine pregnancy must be borne in mind. A bloodstained discharge may be caused by retained products of conception or by a placental polyp.

A watery vaginal discharge is uncommon, apart from obvious cases of urinary fistulae. Discharges of this kind have been described in the condition hydrops tubæ profluens when a hydrosalpinx has been supposed to discharge its contents through the interstitial portion of the tube into the cavity of the uterus. In cases of carcinoma of the Fallopian tube the discharge has been aptly described as amber coloured. During pregnancy a watery discharge is more frequent. It is sometimes seen in cases of hydatidiform mole, and it may be the earliest sign of abortion. In hydrometra gravidarum the watery discharge is probably due to leakage of the liquor amni through rupture of the membranes high above the level of the internal os.

PAIN

Menstrual Pain. During normal menstruation some degree of abdominal discomfort is usual, but in spasmodic dysmenorrhœa the pain may be so severe that the patient is incapacitated. When enquiries are made as to menstrual pain it is important to determine its time of onset. In spasmodic dysmenorrhœa the pain develops typically on the first day of the period of bleeding when, in addition to the usual abdominal discomfort, there is violently severe pain felt in the lower abdomen which may cause fainting and vomiting and be of such intensity that the patient has to lie down. This type of pain rarely lasts for more than an hour when it is followed by the usual abdominal discomfort which persists throughout the period of bleeding. In some cases of spasmodic dysmenorrhœa, the severe pain develops on the

day before the period begins. In cases of congestive dysmenorrhœa, the patients complain of a dull pain in the back and in the lower abdomen which arises two or three days prior to the onset of the menstrual flow and which is relieved by the bleeding. In cases of myomata, painful uterine contractions during menstruation may develop if the tumour becomes submucous or polypoidal. In cases of chocolate cysts of the ovaries severe pain is complained of during the three or four days prior to the onset of menstruation, although in many cases severe abdominal pain may be present during the period of bleeding.

The severity of all types of menstrual pain must be judged by its effect upon the individual patient. Pain which causes incapacitation of working women is obviously severe, less attention can be paid to those cases in which patients are able to exercise their ordinary duties during menstruation.

Abdominal Pain. Severe abdominal pain, not related to menstruation, is present in cases of ectopic gestation, acute salpingo oophoritis, twisted ovarian cysts and torsion of subperitoneal myomata. In such cases the pain is extremely severe, and in cases of tubal rupture with diffuse intraperitoneal bleeding the pain is comparable in severity to that of perforated gastric ulcer and pain of this kind causes collapse and shock. In tubal erosion and abortion, the pain is intermittent and colicky, again of a severe degree. In pelvic peritonitis caused by inflammation of the Fallopian tubes and the ovaries, and in peritonitis caused by septic abortion the onset of the pain is acute, the pain is severe and quite frequently causes nausea and vomiting. As a general rule, uterine myomata do not cause severe abdominal pain except when they undergo red degeneration. Nevertheless, in most cases of myomata, the patients complain of a sense of weight and heaviness situated either low down in the abdomen or in the pelvis. In cases of malignant ovarian tumours attacks of dull pain in the lower abdomen are not uncommon, while with innocent tumours, apart from cases of torsion, it is rare for a history of severe pain to be obtained.

Pain in the Back. This is a common symptom in gynaecological practice. Cases of backache arising after child birth may be due to laxity of the ligaments of the sacro iliac joint, to a lack of tone in the muscles of the back, to pelvic infections resulting from puerperal sepsis and to a bulky subinvolved uterus which is retroflexed. In cases of ovarian pain, caused by either a sclerosed tunica albuginea or small chocolate cysts, the pain is

frequently referred to the back over the second piece of the sacrum. Backache is also encountered in cases in which there has been previous parametritis and when scar tissue has developed around the lacerations of the upper part of the vagina.

Pain on sexual intercourse localised to the vaginal orifice may be caused by difficulty in penetration. Painful coitus is also complained of when the uterus is retroflexed and the ovaries are prolapsed behind the uterus into the pouch of Douglas. A similar type of pain is complained of in cases of salpingo-oöphoritis, of chocolate cysts and of adhesions behind the uterus resulting from pelvic peritonitis.

When the history of pain is being taken, these points must all be borne in mind. The patient must first be asked if she has any pain, if so, the relation of the pain to menstruation must be investigated, as must also be the situation, severity and date of development of the pain.

Previous Pregnancies. It is a common experience in gynaecological practice to find that many gynaecological affections date from a previous confinement or miscarriage. The history of previous pregnancies, confinements and miscarriages should therefore be taken carefully. Enquiries should be made as to the dates of these confinements. If it is found that a patient has not conceived for a long time, and if it is discovered that during the last puerperium the patient had puerperal sepsis or white leg, occlusion of the Fallopian tubes as the result of salpingitis will be suspected. Questions should be asked to determine whether the confinements were difficult, whether instruments were used, and whether the perineum was lacerated. A history of persistent lochia or of a persistent bloodstained discharge from the uterus is suggestive of an infection of the uterus. Similarly, a history of backache suggests the possibility of subinvolution and retroflexion. Again, lacerations of the perineum may lead to prolapse, enquiries should therefore be made as to whether the lacerations were sutured and whether the sutures held. It is well to remember that many gynaecological symptoms date from a previous confinement and particular emphasis should be placed upon obtaining full details of past labours.

Urinary Symptoms. Affections of the urinary tract are common complications of gynaecological abnormalities and the following symptoms should be enquired after as a routine.

Pain on Micturition. In cystitis, micturition is

patients complain of severe discomfort at the end of the act of micturition. Scalding micturition is characteristic of the urethritis of gonorrhœa, of coliform infections, and of an acid urine.

Retention of urine develops in cases of retroflexed gravid uterus, of myoinata incarcerated in the pelvis, of hysteria, and very rarely in cases of hæmatocolpos, pelvic hæmatocele and ovarian cyst impacted in the pelvis. The commonest cause of retention of urine in gynæcological practice, however, is post-operative retention following upon operations upon the vagina, perineum and rectum.

Difficulty in micturition is a symptom of cases of severe cystocele, for, when the patients strain to micturate the cystocele protrudes from the vagina and it may be necessary for the patient to press back the cystocele before she is able to pass urine.

True incontinence of urine is a symptom of cases of urinary fistulæ. *False incontinence* is a common symptom in prolapse, when the patient complains that she has imperfect control over micturition so that the urine dribbles away if the intra abdominal pressure is raised when the patient laughs or coughs.

Frequency of micturition is present during the early weeks of pregnancy, as it is later in pregnancy when the patient is approaching term. Frequency of micturition develops with urinary infections, in prolapse, when pelvic tumours press on the bladder, in addition to the usual diseases of the urinary tract which cause frequency.

Rectal Symptoms

Certain diseases of the rectum and sigmoid colon frequently cause difficulty in gynæcological diagnosis. Diverticulitis and carcinoma of the sigmoid colon may be difficult to distinguish from malignant disease of the ovaries, proctitis is a frequent complication of the radium treatment of carcinoma of the cervix, and hæmorrhoids are commonly found complicating gynæcological diseases. Patients should therefore be asked if there is any pain or difficulty on defæcation and also whether there has been any discharge of blood, pus or mucus from the rectum. In cases of complete tear of the perineum and in cases of recto vaginal fistulæ the patients suffer from incontinence of fæces.

Past Illness

Patients should be asked whether they have had any serious illness in the past and whether they have undergone any surgical operation. For example, pelvic peritonitis resulting from either appendicitis or tuberculous peritonitis may cause subsequent sterility. Similarly, such diseases as diabetes and chronic wasting diseases may lead to amenorrhœa. Chronic disease quite frequently reacts upon the pelvic organs and leads to amenorrhœa. Moreover, past illness such as phthisis and morbus cordis may contra indicate operative treatment.

General Health

General symptoms such as loss of weight, loss of appetite, sleeplessness and headaches, should be investigated. Such symptoms are of great importance in cases of carcinoma and of chronic pelvic infections.

EXAMINATION

The examination of all gynæcological patients should be complete. It is customary to examine the mucous membranes, the tongue, the breasts and abdomen before proceeding to vaginal examination. A vaginal examination is then made and the pelvic organs palpated bimanually. Subsequently, as a routine, the feet are examined for œdema. It is customary to leave the general examination of the patient until later, for if the gynæcological affection is simple and local, it is not regarded as the duty of the gynæcologist for him to investigate in detail the heart and lungs or the gastro-intestinal tract. Nevertheless, if it is decided that operative treatment of any kind is to be undertaken, a complete general examination must never be omitted. Again, if there is reason to believe that the gynæcological symptoms are dependent upon some general disease which reacts upon the pelvic organs, a general examination of the patient is obviously necessary.

A routine examination of the mucous membranes enables any degree of anæmia which may be present to be detected, and a heavily furred tongue is suggestive of pyrexia, caused perhaps by some inflammatory lesion in the pelvis.

The breasts should be carefully examined as a routine in all

cases. Activity of the breasts is manifested by hypertrophy, by the presence of dilated veins on the surface, by the development of Montgomery's tubercles, and by the production of a secondary areola. During pregnancy the breast tissue becomes more granular, and a clear secretion can be expressed from the nipple. Well marked activity of the breasts is restricted to pregnancy, but some hypertrophy is common in the new born and at puberty, and can also be detected in cases of myomata in which the ovaries are hyperplastic and contain large corpora lutea. It is extremely important to be able to recognise the early signs of activity in the breasts, for such activity can be detected in cases of ectopic gestation.

Abdominal Examination

Abdominal examination must be performed systematically by inspection, palpation, percussion and auscultation. The examination should be made from the right side of the patient and the abdomen should be completely exposed.

Inspection. Many gynæcological tumours produce large abdominal swellings which arise from the pelvis and which can be seen to be restricted above and to the sides. In such cases the abdomen is more prominent below the level of the umbilicus. In cases of ascites the abdomen though protuberant, is flattened in the region of the flanks, moreover, in cases of ascites dilated veins can usually be seen beneath the skin running longitudinally in the flanks. Eversion of the umbilicus is a physical sign of intra abdominal pressure, and is seen in cases of large ovarian tumours and of ascites. The mobility of the abdominal wall on respiration should be investigated. In cases of pelvic tumours which extend up into the abdomen the abdominal wall moves over the tumour during inspiration so that the situation of the upper limit of the tumour is apparently altered. In cases of pelvic peritonitis the abdomen is distended and its movements below the level of the umbilicus are restricted. Striæ gravidarum develop during pregnancy but are not uncommon with large abdominal tumours in young women.

Palpation. The examining hands should be warm. It will be found that the lower abdomen can best be examined with the left hand, if the examination is made from the right side of the patient. Gynæcological swellings extend upwards from the pelvis, and it is easier for the left hand to palpate the upper

border of the swelling than the right, for the sensitive ulnar border is more likely to detect small swellings arising from the pelvis. Most gynaecological swellings are easily felt, and it is unnecessary to exert much pressure upon the abdominal wall. Myomata have a peculiar solid consistence except when they are cystically degenerate, their surfaces are smooth except when the tumour is bossed through the presence of multiple myomata. Ovarian cysts have smooth surfaces and fluctuate, they can be demarcated above, but large cysts are not always well defined laterally. The typical ovarian cyst has a peculiar tense consistence which is very characteristic. The pregnant uterus is soft, and if patience is exercised, may be found to contract under the hand. The foetus can be outlined after about the 24th week, and before then external ballotement can be elicited. The pyriform shape and the peculiar consistence are again characteristic of the pregnant uterus. The full bladder projects anteriorly more than any other abdominal swelling, it is not movable and is usually extremely tender. In all cases of abdominal swelling the possibility that the tumour is either the full bladder or the pregnant uterus must be borne in mind. It is easy to diagnose a full bladder or a pregnant uterus if either condition is suspected. Mistakes are made when these possibilities are never thought of.

It may be extremely difficult to determine whether abdominal swelling in a fat woman is due solely to the presence of fat or whether there is an accompanying intra abdominal swelling. In such cases more reliance should be placed upon the physical signs elicited by percussion than those found by palpation.

Extreme tenderness on palpation is characteristic of peritoneal irritation. In cases of salpingitis and of pelvic peritonitis there is extreme tenderness below the level of the umbilicus. This extreme tenderness is very characteristic, it is different, for example, from the tenderness of a tender sigmoid colon. Tenderness of a well marked degree is present in cases of ectopic gestation and twisted ovarian cyst. A red degenerate myoma is also extremely tender.

Percussion. Uterine myomata and ovarian cysts are dull to percussion, and in such cases the flanks are resonant. Dullness in the flanks and shifting dullness indicate the presence of free fluid within the abdominal cavity. Ascites of this kind is present in most cases of malignant ovarian tumours. With tuberculous peritonitis with encysted ascites, and rarely in cases

of large pelvic hæmatocœles, abdominal tumours may be palpated which are tympanitic on percussion as the result of adherent bowel

Auscultation Auscultation of an abdominal tumour may lead to the detection of the foetal heart pulsating or of foetal movements. A uterine souffle may be detected not only over the pregnant uterus, but also in cases of large myomata

Routine examination of the abdomen should include not only the details which have just been mentioned, but also the examination of the kidneys, liver and gall bladder, stomach and large intestine. Unless these organs are examined mistakes will be made. For example, in cases of pelvic tumour an examination of the upper abdomen may lead to the identification of a carcinoma of the stomach or of large metastases in the omentum. Such findings may influence not only the diagnosis but also the subsequent treatment

Vaginal Examination

In this country it is customary to make vaginal examinations with the patient lying in the left lateral position. The patient lies on her left side with the buttocks well over to the edge of the couch, with the right knee drawn up towards the chin and with the right shoulder thrown over to the opposite side of the couch. This position can easily be assumed from the dorsal position in which the patient has been lying during the abdominal examination. The left lateral position gives a good exposure of the external genitalia, and specula can be easily inserted with the patient in this position. Quite often the left appendages can be more easily felt when the patient is lying on her left side than when lying in the lithotomy position. Again, women naturally prefer being examined in the left lateral position than in the lithotomy position. The lithotomy position is, however, much more convenient for examining the external genitalia and the cervix

A rubber glove should always be worn on the right hand during vaginal examination, but it will be found that bimanual examinations can be carried out more accurately if the left hand is bare

Vaginal examinations should be made systematically and a strict routine should be followed if the examination is to be complete. Students should remember that an accurate vaginal examination depends upon a knowledge of anatomy and upon

experience and the more important factor of the two is experience. Students should never lose an opportunity of making a vaginal examination even in normal cases. It is impossible to acquire the technique of bimanual examination without practice, and much experience is required before gynaecological abnormalities can be detected with any accuracy. Failures to find physical signs in gynaecology mostly depend upon incomplete examinations, the average student does not follow a strict routine in his examination, and tends to be satisfied if he has succeeded in locating the uterus. The more examinations a student makes the more confidence will he acquire as to his ability to elicit physical signs.

External Genitalia The vulva is first examined, the labia, clitoris, urethral meatus and vaginal orifices being inspected in turn. Most abnormalities of the vulva are easily recognised by inspection. Care should be taken to avoid palpating any sores or ulcers which may be syphilitic. It will often be found necessary to ask the patient to raise her right knee before the anterior part of the vulva can be examined, for one of the disadvantages of the left lateral position is that it does not give a good exposure of the anterior part of the vulva in fat patients. The urethra should be inspected for evidence of urethritis, of caruncle, of prolapse of the mucous membrane and of carcinoma. In acute gonorrhoea the meatus is reddened and pus can be seen being discharged from the urethra. In such cases the orifices of Skene's tubules, which lie immediately within the meatus, are reddened and inflamed, and the ducts of the periurethral glands are also conspicuous by their red colour.

The hymen should be examined, for it is not usual to perform vaginal examinations in young people when the hymen is intact. Abnormalities of the hymen, such as hymen rigidus, should be recorded. In patients of post menopausal age, reddening of the epithelium around the hymen and vaginal orifice is seen in cases of *leucosis vulvae* and is associated with the development of white opaque areas on the adjacent epithelium. The ducts of Bartholin's glands should be inspected. The mouths of the ducts lie external to the hymen at the junction of the anterior third and posterior two thirds of the vaginal orifice. In gonorrhoea the mouths of the ducts are reddened, and quite frequently pus can be seen being discharged from the ducts. Bartholin's gland cannot be palpated except when it is inflamed, but in acute gonorrhoea the gland can be felt quite easily, deep

to the tissues of the labia at the level of the posterior third of the vaginal orifice. In Bartholin's abscess, a fluctuating swelling is found in the situation of the gland, which extends anteriorly and may discharge itself on the inner surface of the labium minus. Bartholin's cysts lie deep to the tissues of the labium minus and extend anteriorly along the course of the labium minus so that the labium minus is stretched over the swelling. Herniæ, cysts of the canal of Nuck, lipomata and adenomyomata are found more laterally in the tissues of the labium majus. The perineum should be inspected for scars and old lacerations. complete tears of the perineum are easily recognised because the red mucous membrane of the rectum fuses with the posterior vaginal wall without the intervention of the tissues of the perineal body.

The patient should now be asked to strain down to enable any prolapse which may be present to be detected. If there is any prolapse it is important to know exactly which structures are affected. whether the prolapse consists of the anterior vaginal wall, the cervix or the posterior vaginal wall. In all cases of prolapse of the posterior vaginal wall a rectal examination must subsequently be made to determine whether there is an associated rectocele.

Interal Examination. Two fingers of the right hand, lubricated with soap or vaseline are now inserted into the vagina. The most sensitive part of the vulva lies anteriorly in the region of the clitoris and urethral meatus, if, therefore, there is difficulty in inserting two fingers, the perineal body should be pressed posteriorly. The next step in the examination is palpation of the perineal body and of the levator ani muscles. The perineal body is examined by placing two fingers in the vagina, flexing them posteriorly and palpating the perineal body between these fingers and the thumb which is placed externally. In this way the thickness of tissue contained in the perineal body and the tone of the contained muscles can be judged. The fingers are now turned and flexed laterally above the level of the levator ani muscles. The levator muscles can easily be palpated between the vaginal fingers and the thumb placed externally over the labium majus. The tone of the levator muscles can then be judged and in cases of prolapse the degree to which the muscles have separated can be estimated very accurately.

The next step is to examine for evidence of vaginal discharge

In some cases discharge is seen during inspection of the vulva, but quite often the discharge first appears after the fingers have been placed in the vagina. The characters of the discharge should be noted. In gonorrhœa the discharge is purulent, profuse and greenish in colour, in leucorrhœa the discharge is thin and fluid, yellowish in colour, and associated with reddening of the vaginal walls.

The vagina is now examined by palpation and such gross abnormalities as septate vagina and carcinoma of the vagina are easily detected. In colpitis granulosa the upper third of the vagina, particularly around the posterior fornix is granular and irregular. Vaginal scars caused by old lacerations are most prominent near the cervix where they are often found to be continuous with lacerations of the cervix itself. During pregnancy, in addition to its mauve discoloration, the vagina is softened, particularly in the upper part. In prolapse the vaginal walls are lax with little sense of resistance of the perivaginal tissues.

The Cervix

When the uterus is in its normal position of anteflexion and anteversion, the first part of the cervix felt by the examining fingers is the anterior lip. In retroflexion the cervix is directed downwards and forwards so that its lowest part is either the external os or the posterior lip. A long slender conical cervix is found in cases of ill development of the uterus while with chronic cervicitis it is common to find the cervix enlarged and hard. Congenital vaginal elongation of the cervix is easily recognised by the depth of the vaginal fornices and quite often in such cases the cervix projects almost half way down the vagina. In nulliparæ the external os is circular, while after child birth an anterior and posterior lip can be distinguished. Lateral laceration of the cervix is frequent in multiparous women and in most cases the cervix is torn on the left side. Severe lacerations of the cervix are usually the result of the application of forceps prior to full dilatation of the os, and they may be found both in the anterior lip and in the posterior lip when scar tissue can often be traced backwards to the posterior vaginal wall. The normal cervix is smooth and its texture is firm. In carcinoma of the cervix, the cervix bleeds vigorously on examination. It is friable, and usually there is well marked

induration at the periphery of the carcinoma. Such abnormalities as polypi may be detected. Erosions are difficult to distinguish with a gloved finger, although a difference in texture around the external os is suggestive of the presence of an erosion. Speculum examination, however, is necessary before the presence of an erosion of the cervix can be established. Dilatation of the external os is present in cases of polypi which

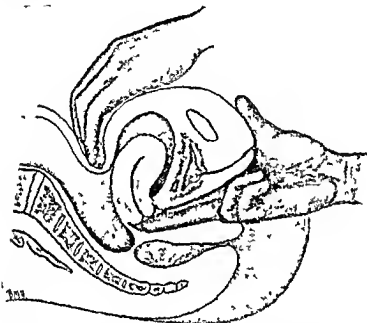


FIG. 42. Bimanual examination. Two fingers of the right hand are placed in the vagina and press the cervix upwards and backwards. The external os is placed on the lower abdominal wall and is insinuated behind the uterus. The uterus is then felt between the fingers of the two hands.

lie within the cervical canal, in cases of inversion of the uterus and in cases of retained products of conception following upon abortion. While the cervix is being examined the patient should again be asked to strain down, and in this way any prolapse of the uterus which may be present can be recognised.

Examination of the cervix should be systematic, and the following points should be investigated as a routine.

- (a) The direction in which the cervix is pointing.
- (b) Whether the cervix descends upon straining.

- (c) The texture of the cervix
- (d) The degree of dilatation of the external os
- (e) Whether the cervix bleeds on examination

Bimanual Examination

The uterus and its appendages should now be examined bimanually. Two fingers of the right hand are placed in the anterior fornix of the vagina against the front of the vaginal

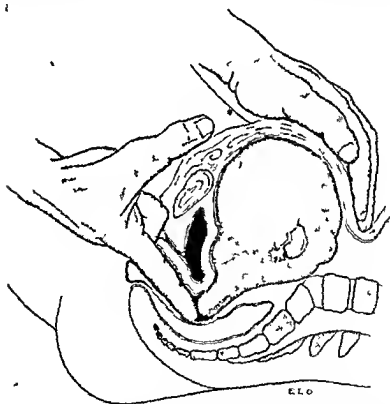


FIG 43. Bimanual examination in the case of multiple uterine myomata. Note how the external hand is placed high in the abdomen well above the level of the tumour. Movements are transmitted between the two hands directly through the tumour (After Halban Seitz)

portion of the cervix. These fingers press up the uterus while the external hand placed on the lower abdomen is brought to lie behind the uterus. The uterus is then palpated between the fingers of the two hands. Beginners are apt to forget that most

of the physical signs elicited by bimanual examination are detected with the external hand. A common error is for the fingers of the right hand to push upwards in the direction of the symphysis pubis rather than towards the lumbar vertebrae. Again, the pressure exerted by the left hand should be not only downwards but from behind forwards. A mistake which is frequently made is to place the left hand immediately above the symphysis pubis and simply to press downwards with the left hand. The left hand should be placed on the abdomen well above the level of the symphysis pubis and the fingers of the left hand should reach as far back as possible before being drawn downwards and forwards to meet the uterus. The technique of bimanual examination is difficult to describe in words, experience alone teaches the method to be followed.

The Uterus

During the bimanual examination of the uterus the following points are investigated in turn.

The Position of the Uterus Normally the uterus lies in the midline. It may be congenitally displaced to one side when it usually lies to the left, or it may be laterally displaced by such swellings as myomata of the broad ligament, ovarian cysts, adnexal inflammatory swellings, tubal gestation and the effusion of parametritis. In some cases the uterus is drawn over to one side as the result of contraction of scar tissue in the parametrium resulting from previous parametritis.

The retroflexed uterus is not easily palpated bimanually, but the fundus of the retroflexed uterus can readily be detected through the posterior fornix. After bimanual examination it will be possible to say whether the uterus is anteflexed or retroflexed, anteverted or retroverted.

The Size of the Uterus Experience is necessary before an opinion can be given as to whether the uterus is of normal size when the patient is fat. Owing to the thickness of the abdominal wall the impression is often given on bimanual examination that the uterus is enlarged. An ill developed uterus is frequently acutely anteflexed but in such cases the size of the uterus can be accurately determined.

The Surface of the Uterus Bosses on the surfaces of the uterus indicate the presence of myomata.

Mobility of the Uterus The normal uterus is movable to

some degree in all directions. This mobility is restricted (i.) in cases of carcinoma of the cervix when the parametrium has become infiltrated with growth; (ii.) when fibrous tissue has formed in the parametrium either as the result of parametritis or following upon extensive lacerations of the cervix and vaginal vault; (iii.) with peritoneal adhesions resulting from pelvic

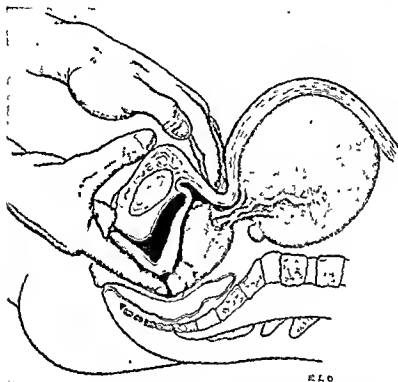


FIG. 44. Bimanual examination in the case of an ovarian cyst. The nature of the tumour is determined on bimanual examination because the uterus can be identified apart from the abdominal tumour. Compare Fig 43. In some cases the pedicle can be distinguished if the fingers in the vagina are placed high up in the posterior fornix. Movements of the abdominal tumour are clearly not transmitted to the cervix (After Halban Seitz.)

peritonitis; and (iv.) in cases of salpingo-oophoritis. In cases of peritoneal adhesions movement of the uterus causes severe abdominal pain.

The Uterine Appendages. Before an attempt is made to palpate the uterine appendages the position of the uterus must be established. With some pelvic tumours there may be difficulty in deciding whether the tumour is the enlarged uterus or whether it is a swelling of the appendages. When the uterus

cannot be outlined with certainty the following investigations should be made Try to follow up the cervix with the fingers in

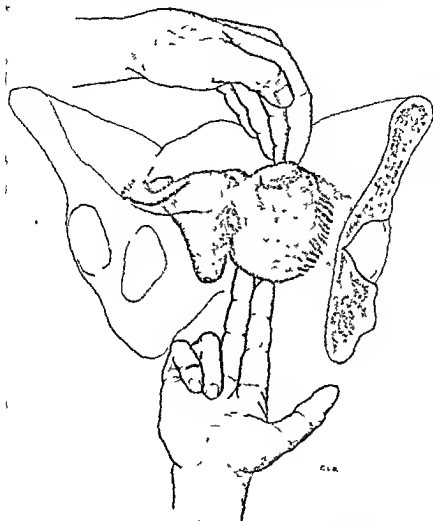


FIG. 45. Bimanual examination in the case of a pyosalpinx. Note that the uterus is displaced over to the opposite side. The fingers in the vagina are moved to one side of the cervix and they feel the lower pole of the swelling. (After Halban Seitz.)

the vagina to discover with which swelling the cervix is continuous. Next, press down upon the abdominal swelling and determine whether the cervix itself is pushed down (Fig. 43). Movements of the body of the uterus are always transmitted to

the cervix, on the other hand, movements of an ovarian cyst are usually not transmitted. Similarly, move the cervix in the vagina and determine whether such movements are transmitted to the abdominal swelling. If so, the abdominal swelling is almost certainly the uterus. The fundamental sign of an adnexal swelling is that it can be identified separate from the uterus (Fig 41). Conversely, unless a swelling can be distinguished separate from the uterus the diagnosis of an adnexal swelling should never be made with certainty.

In the identification of the uterine appendages the two fingers are placed in the lateral fornix of the vagina. The left hand is placed to one side of the uterus and efforts are made to outline the adnexa between the fingers of the two hands (Fig 45). A similar technique is used to that employed in palpating the uterus. Sometimes, however, it will be found that the ovaries can best be palpated by pressing them against the lateral wall of the pelvis, this is particularly so in the case of the left ovary.

Some patients are extremely easy to examine so that the round ligaments, the Fallopian tubes and the ovaries can easily be felt. On the other hand, in most cases, however skilful the manual examination, it is quite impossible to palpate the normal Fallopian tube. Swellings of the uterine adnexa tend to be prolapsed behind the uterus into the pouch of Douglas rather than to extend upwards. For this reason the pouch of Douglas should be examined through the posterior fornix in an endeavour to detect the lower pole of an adnexal swelling.

Inflammatory swellings of the uterine appendages are tender and fixed, while ovarian tumours have smooth surfaces, are not tender, and can usually be moved easily. Tubal gestations have a characteristic consistence because most of the swelling is composed of blood clot. With hydrosalpinx and pyosalpinx it is often possible to distinguish their retort like shape with the dilated ampullary part of the tube prolapsed behind the uterus into the pouch of Douglas. In parametritis a dense induration is felt to one side of the uterus, which extends laterally to the pelvic wall, from which the uterus cannot be demarcated. Such parametric effusions push the uterus over to the opposite side, and extend backwards along the utero sacral ligaments where they can easily be felt by rectal examination.

✓ The Pouch of Douglas. The pouch of Douglas can be examined very easily through the posterior fornix, for only the peritoneum and the posterior vaginal wall intervene between

the posterior fornix of the vagina and the peritoneal cavity. The commonest swelling felt through the posterior fornix is a collection of faeces in the sigmoid colon. Next in order of frequency comes the retroflexed body of the uterus. Pelvic abscesses in the pouch of Douglas produce dense indurated swellings in which areas of softening can be detected. Pelvic hæmatoceles have the characteristic consistence of blood clot and produce fixity of the surrounding structures. The lower poles of ovarian tumours and adnexal inflammatory swellings can also be felt in the pouch of Douglas while the presence of discrete hard nodules is a characteristic finding in cases of malignant ovarian tumours. The swelling of diverticulitis can be felt in the pouch of Douglas on the left side, and it is usually possible to establish that such swellings are separate both from the uterus and from the left appendages. The swelling of diverticulitis is tender and fixed. Such swellings may give rise to difficulty in diagnosis, but if the possibility of diverticulitis is borne in mind the diagnosis should be established by taking an X ray photograph of the bowel after a barium enema has been given.

Speculum Examination

The next step in the pelvic examination is to pass a speculum in order to examine the vagina and cervix visually. The best

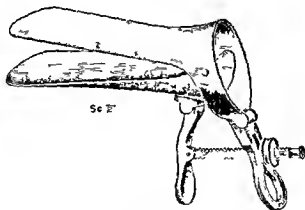


FIG. 46. Fergusson's speculum.

form of speculum to use is the self retaining bivalve speculum of Cusco or some modification of it. Fergusson's speculum, best made of metal, is a hollow cylindrical tube, cut obliquely at its

upper end, so that it fits into the posterior fornix with the cervix projecting into its lumen. Fergusson's speculum is not always



FIG. 47. A Fergusson's speculum.

easy to introduce, it should be lubricated, and as it is passed through the vaginal orifice the perineum should be pressed backwards. As the speculum is passed along the vagina it is

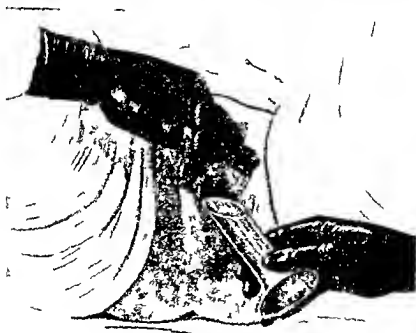


FIG. 48. Introduction of a Fergusson's speculum. Note tilted position in which the speculum is held. (Liden and Lockyer.)

rotated so that the lower end passes forwards. When the speculum is in position it lies along the axis of the vagina and its lower end is directed well forwards. Beginners often have difficulty in exposing the cervix with a Fergusson's speculum.

because they direct the upper end of the speculum too far anteriorly, and they forget that the long axis of the vagina is approximately parallel to the brim of the pelvis

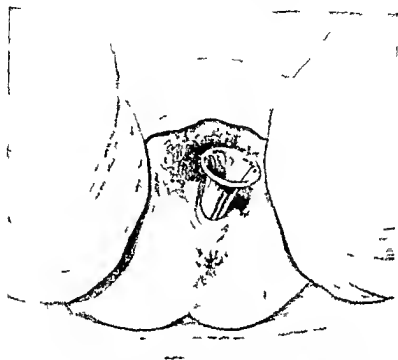


FIG. 49 Sargassum speculum after introduction (Liden and Lockyer)

Sims' speculum was devised by Marion Sims for exposing vesico vaginal fistule and was intended for use with the patient

lying in the left lateral position Sims' speculum is an extremely useful instrument to use when the patient is lying in the lithotomy position, but assistance is required if it is employed to expose the cervix when the patient is lying in the



FIG. 50 Sims speculum

left lateral position The most useful speculum is Cusco's, for it can be inserted without causing discomfort, it can be opened

out and adjusted to the size of the vagina, and above all it is self retaining. For routine examination with the patient lying in the left lateral position, Cusco's speculum is strongly recommended.

During the insertion of the speculum the vaginal wall can be examined for such abnormalities as colpitis senilis, and colpitis granulosa. The cervix can be examined by inspection for such abnormalities as erosions, lacerations, polypi and carcinoma. Illumination of the vagina can be obtained by the use of an electric torch. Speculum examination of the cervix should be employed as a routine and it is essential in all cases in which vaginal hæmorrhage has followed bimanual examination. Early carcinoma of the cervix cannot be detected by palpation, speculum examination must always be employed in suspected cases.

While the cervix is exposed by a speculum, further investigations can be carried out. It may be necessary to make bacteriological examinations of the discharge from the cervical canal. In such cases the cervix should first be swabbed clear of mucus with wool soaked in a weak solution of sodium bicarbonate, then swabbed dry with a sterile swab. The discharge from the cervical canal is then collected either with a platinum loop or with a throat swab. In other cases, small mucous polypi can be twisted off the cervix, while in cases of suspected carcinoma a small piece can be excised from the suspicious area with long pointed scissors. Similarly, in cases of retroflexion, it may be decided to attempt to replace the uterus by fixing a pair of volsellum forceps on the anterior lip. It is often stated that the cervix is insensitive; this is not strictly true, but there is usually very little discomfort either in twisting off polypi from the cervix or in attaching volsellum forceps to the anterior lip.

It will be found most convenient if a speculum is first passed before tampons are inserted into the vagina. The simplest method of inserting a tampon is to introduce a Sims' speculum, and with it to press back the perineal body. Tampons can then be easily inserted and, when necessary, pushed high up against the cervix. Unless a speculum is used the introduction of a tampon may not only be extremely difficult, but it may be extremely painful.

The uterine sound is very rarely used at the present day except when the patient is anæsthetised. It is a dangerous

instrument to use, and it is of little service for ordinary investigations

Rectal Examination

Rectal examination is frequently performed during gynaecological investigations. In virgins bimanual examination of the pelvis is carried out with one finger inserted into the rectum. The method is not so exact as bimanual vaginal examination, but it often allows the ovaries to be more easily identified. In cases of parametritis and carcinoma of the cervix, rectal examination is performed as a routine, for the utero sacral ligaments are easily felt by rectal examination and any induration present can be recognised. Similarly, a rectal examination should be made whenever swellings or indurations either of the posterior vaginal wall or of the pouch of Douglas have been detected. In this way it will be established whether the swellings lie in front of the rectum. Unless rectal examinations are performed as a routine in such cases, tumours such as carcinoma of the rectum will be missed. A rectal examination should always be made when the patients have complained of rectal symptoms which may be caused by such conditions as hæmorrhoids, anal fissures and polypi.

Examination of Discharges

It may be necessary to make bacteriological investigations of discharges. In cases suspected of gonorrhœa material for examination must be collected from the urethra, the ducts of Bartholin's glands, and from the cervix. A finger should be inserted into the vagina and the urethra massaged against the posterior surface of the symphysis pubis so that the discharge is expressed from the urethral meatus. This discharge is collected with a platinum loop. Similarly, on compression of Bartholin's glands, pus may be expressed from the ducts, if so it should be examined bacteriologically. The technique of collecting the discharge from the cervix has already been described in the paragraph dealing with speculum examination. In gonorrhœa it is almost useless to attempt the demonstration of the gonococcus in the pus cells of the vaginal discharge, for not only are degenerate pus cells and epithelial cells present in large numbers, but enormous numbers of other organisms are found as well, and it is usually impossible to demonstrate the presence of the gonococcus with certainty. With trichomona infections the

vaginal discharge should be collected in a platinum loop, and it is most convenient first to insert a speculum such as Cusco's. The trichomona is demonstrated in hanging drop preparations.

Examination of the Urinary Tract

When patients have had urinary symptoms it is necessary to examine the bladder carefully by bimanual examination. Stones in the bladder and carcinoma of the bladder can usually be palpated without difficulty.

The urine should be examined chemically for albumen and sugar and a microscopical examination should also be made when urinary infections are suspected. With carcinoma of the cervix infiltration of the bladder is best recognised by cystoscopic examination. In the earliest stage of involvement of the bladder there is a bullous oedema of the bladder wall, later, retraction of the bladder wall develops, while in advanced cases the growth ulcerates into the cavity of the bladder. With carcinoma of the cervix it may be necessary to examine for involvement of the ureters either by examining the effluxes from the ureteric orifices or by ureteric catheterisation.

Other Examinations

If a pelvic abscess is suspected it is necessary to make a leucocyte count of the blood, while in cases of anæmia resulting from such diseases as myomata and carcinoma of the cervix, a red blood count, together with an estimate of the hæmoglobin content of the blood are carried out as a routine prior to abdominal operations. In cases of severe anæmia it may be necessary to perform blood transfusion prior to operation.

It may be necessary to make an X-ray examination of the gastro-intestinal tract to exclude such conditions as diverticulosis and carcinoma of the bowel. The blood pressure should be taken as a routine in patients of menopausal age. Other examinations which may be necessary are the determination of the Wassermann reaction, the estimation of the fragility of the red blood corpuscles and an estimation of renal function.

It cannot be too strongly emphasised that failures and mistakes in diagnosis usually depend upon incomplete investigation. Before operation is performed upon any patient, a complete examination should be made to exclude latent disease.

PROGNOSIS

At the completion of the examination it is necessary to give an opinion both to the patient and to her relations and friends. A truthful opinion both as to diagnosis and prognosis must always be given to the patient's relations. On the other hand, it is a fundamental mistake ever to tell a patient that she is suffering from some grave disease, and it should be regarded as a principle never to tell a patient that she has cancer. Fortunately, innocent growths of the female generative organs are frequent, and most women are aware that myomata are extremely common. If a patient suffering from carcinoma asks a direct question as to whether a carcinoma is present or not, the answer should be that she has an ulcer which may very well become malignant unless it is treated appropriately. It is important always to be truthful to the relations both as regards the diagnosis and prognosis. Most people are sufficiently sophisticated to know that fatalities, which are both unforeseen and unpreventable, follow upon operative treatment of any kind. In cases of carcinoma of the cervix it should be pointed out to the relations that the patient has a cancer of the womb, that they must realise the gravity of such a disease, but that if appropriately treated it is not uncommon for patients to survive for several years without evidence of recurrence. A frank statement of the case in this way indicates to the relations the gravity of the disease and throws out hope in a way which is perfectly truthful.

CHAPTER V

MALFORMATIONS OF THE FEMALE GENERATIVE ORGANS

THE congenital malformations of the female generative organs are infrequent, and probably comprise less than 1 per cent of gynaecological material. The cases are usually of little practical importance, and few examples are ever seen by general practitioners.

The development of the female genitalia consists, in the main, of the fusion of the two Mullerian ducts with their subsequent canalisation and hypertrophy, and as this process may be arrested at any stage, a large number of different forms of maldevelopment have been recorded.

Errors of development may be classified as follows —

Hermaphroditism and pseudo-hermaphroditism, in which there are abnormalities of development of the sex glands and external genitalia

Aplasia in which organs have failed to develop

Hypoplasia in which organs are rudimentary

Atresia in which there is either complete or partial failure of canalisation of the Mullerian ducts

Atresia of the Female Generative Organs

The most important malformations are the result of failure of canalisation of the Mullerian ducts.

Atresia of the Fallopian tubes may be partial or complete when it gives rise to sterility

Atresia of the body of the uterus is a very rare malformation, but atresia of the cervix alone is more common

Congenital atresia of the vagina, in which the vagina is imperforate, is a rare malformation. In such cases the occlusion of the vagina is situated either in the upper third of the vagina or immediately above the level of the hymen. The commonest form of atresia that is seen is imperforate hymen. In atresia hymenalis the membrane occluding the vaginal orifice consists

of two layers, the lower of which represents the normal hymen, while above this and adherent to it lies an imperforate septum which is found on histological examination to be covered by transitional epithelium on its inner surface. Such cases are attributed to failure of the lowest part of the Mullerian ducts to canalise rather than to failure of that part of the cloacal membrane which forms the hymen to break down. Atresia of the

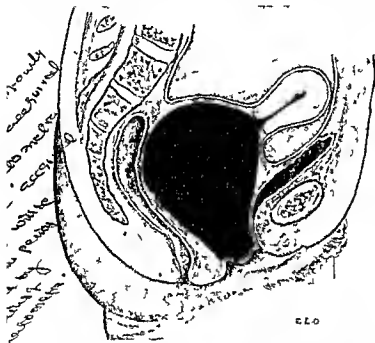


FIG 51 Atresia hymenalis hematocolpos. The illustration shows (a) how the hymen bulges externally, (b) how the distended vagina is easily palpable from the rectum, (c) how the uterus can be felt from the abdomen on the top of the swelling (d) how retention of urine may result from compression of the urethra against the symphysis pubis (After Stöckel)

vagina and of the hymen is not necessarily a congenital malformation. Such inflammatory conditions as are seen in the gonococcal vulvovaginitis of children, in diphtheria and even in infectious diseases such as measles and scarlet fever, can lead to the formation of adhesions which produce atresia. Similarly, the cervix may become occluded after such cervical operations as partial amputation and repair, in which technical errors have been made. Menstrual blood then collects in the uterus and produces hæmatometra.

Atresia Hymenalis Hæmatocolpos The most important type of atresia is the congenital form of atresia hymenalis. The history obtained reveals that the expected onset of menstruation is delayed and that at monthly intervals the patient complains of pain in the lower abdomen and of such general disturbances as headaches, constipation and malaise. The patient may seek medical advice either because the onset of menstruation has been

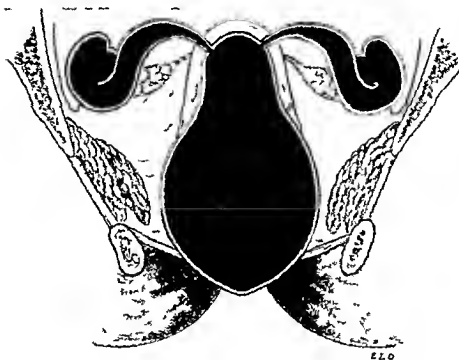


FIG 52 Atresia hymenalis with hæmatocolpos hæmatometra and hæmostalpinx (After Stuekel)

delayed or because retention of urine has developed. The patients are usually about 16 years of age. In cases of imperforate hymen menstruation proceeds rhythmically, but the menstrual discharge becomes pent up in the vagina and causes the condition hæmatocolpos. Already by the time the patient seeks medical advice a large tumour has developed which fills the pelvis and which can be easily palpated in the lower abdomen. On vaginal examination the imperforate hymen bulges externally and the retained dark coloured blood can be seen through the thin almost translucent septum. The retained menstrual

discharge is fluid, consists of mucus and altered blood and contains a high percentage of calcium

The vagina is capable of very great distension, so that in cases of hæmatocolpos it is not uncommon for a large tumour to be found which almost completely fills the pelvis, pushes the bladder forwards and upwards, almost occludes the rectum, and extends out of the pelvis into the abdominal cavity. The uterus can be palpated on the upper surface of the tumour by abdominal examination. In late cases of hæmatocolpos the pent up menstrual discharge not only fills the vagina but distends the uterus and produces a hæmatometra. The blood may extend upwards into the Fallopian tubes and pass into the peritoneal cavity where, by producing peritoneal irritation, adhesions are formed around the abdominal ostium of the Fallopian tube which close the Fallopian tube and lead to the production of a hæmatosalpinx. Such cases, however, are extremely rare, and in most cases of imperforate hymen the retention of blood is restricted to the vagina. Hæmatometra and hæmatosalpinx should be regarded as very exceptional complications of imperforate hymen. Very rarely the hæmatosalpinx ruptures and discharges its contents suddenly into the peritoneal cavity, when severe pain is produced and the patient passes into a condition of shock and collapse.

Diagnosis

The diagnosis of hæmatocolpos is made without difficulty for the bulging septum at the vaginal orifice is very obvious. Simple hæmatocolpos, in which the retention of the menstrual discharge is restricted to the vagina should not be regarded as a dangerous condition. If, however, the uterus and Fallopian tubes have become distended with blood the condition is extremely severe because of the risk of post operative infection of the peritoneal cavity. The retained menstrual fluid affords an excellent medium for the growth of micro organisms, and it is well known clinically that severe pelvic peritonitis may follow upon evacuation of a hæmatocolpos which is complicated by hæmatometra and hæmatosalpinx. For this reason the abdomen should be examined carefully in cases of hæmatocolpos, and if the uterus is enlarged or if there is tenderness in the region of the Fallopian tubes a graver prognosis must be given. In vaginal atresia and cervical atresia, distension of the uterus and

Fallopian tubes with blood is much more frequent than with atresia hymenalis.

A comparable form of atresia is that in which the uterus is bicornuate with one horn of the uterus shut off from the vagina, in which the menstrual discharge is retained. Such cases are met with clinically in patients who are usually over the age of 20, and there is a variety of types. Sometimes there is duplication



FIG 53. Bicornuate uterus. The cornu on the right communicates with the vagina. On the left the cornu does not communicate with the vagina. On this side the cervical canal became distended with menstrual blood which subsequently became infected and led to salpingitis and pelvic peritonitis.

both of the uterus and the vagina, when a large tumour, comparable in size to that found in cases of hæmatocolpos, may develop. The more common form is when the maldevelopment is restricted to the uterus and the menstrual discharge is retained in an accessory horn. Severe abdominal pain is then complained of, and on examination a tense, tender, fluctuating tumour is found to one side of the uterus. Not uncommonly the retained blood becomes infected and gives rise to a severe degree

of salpingo-oöphoritis and pelvic peritonitis. The exact diagnosis is usually made at laparotomy, when it should be borne in mind that an accessory cornu is recognised by the position of attachment of the round ligament.

Treatment

The treatment of hæmatocolpos consists in excising the septum at the lower end of the vagina and of inserting, if necessary, a few hæmostatic sutures in the cut edges. Formerly, hæmatocolpos was treated by slow evacuation, because it was believed that infection was apt to follow rapid evacuation. It is now known that the most important consideration is to determine whether the uterus and Fallopian tubes are distended with blood. After the evacuation of the hæmatocolpos, while the patient is still under the influence of the anæsthetic, the cervix should be exposed with specula. If the os is found to be closed it can be taken as certain that the menstrual discharge is not retained either in the uterus or in the Fallopian tubes and no further treatment is required. If, on the other hand, the cervix is dilated and a hæmatometra is present, a bimanual examination must be made to determine whether the Fallopian tubes are involved. If the Fallopian tubes are distended the correct procedure is to remove the Fallopian tubes and uterus by abdominal operation. It is now established that infection of a hæmatometra and hæmatosalpinx almost always follows upon evacuation of a hæmatocolpos from below, and that a fatal peritonitis is the usual result. It must be emphasised again, however, that involvement of the uterus and Fallopian tubes in cases of imperforate hymen is very exceptional, and that in the average case the retained menstrual fluid is restricted to the vagina.

DUPLICATIONS AND MALFORMATIONS OF THE UTERUS AND VAGINA

If the two Müllerian ducts fail to fuse along the whole of their lengths, and if they develop normally and remain separate, a condition which is termed uterus didelphys results. This extreme degree of maldevelopment is usually associated with gross errors of development in other parts of the body so that it is rare to meet the condition in adults. In uterus didelphys, the two vaginas open at the vulva where a vaginal septum can be

seen A cervix lies at the top of each vagina and the two parts of the uterus above the level of the cervixes are completely separate



FIG. 54 Uterus didelphys (Eden and Lockyer)



FIG. 55 Uterus bicornis bicollis (Eden and Lockyer)

From this complete degree of separation of the two Mullerian ducts there are all sorts and varieties of imperfect and incomplete fusions. Very few of these have any clinical importance.

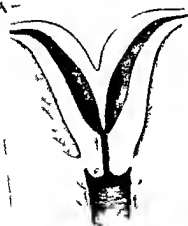


FIG. 56 A uterus bicornis unicollis (Eden and Lockyer)



FIG. 57 A uterus septus (Eden and Lockyer)

and most forms are extremely rare. In uterus duplex and vagina duplex the two Mullerian ducts are partially fused in the

region of the body of the uterus, and one side is usually better developed than the other.

In uterus bicornis bicollis the vagina is single, but the two cornua of the uterus remain separate and two complete cervixes project into the vagina. In some cases of this kind a partial vaginal septum is present.

In uterus bicornis unicollis the two cornua of the uterus are



FIG. 58. A uterus subseptus.
(Eden and Lockyer.)



FIG. 59. A uterus unicornis with an accessory cornu (Eden and Lockyer.)

separate in the region of the body, but there is a single cervix and a single vagina.

In uterus septus, although the two Mullerian ducts have fused, a medium septum passes from the fundus of the uterus through the cervix and may extend into the vagina.

In uterus subseptus this septum is restricted to the body of the uterus.

Clinical Aspects of the Malformations of the Uterus

Such malformations as septate vagina may cause difficulties during coitus and during parturition, and errors might conceivably be made during parturition in the case of the uterus didelphys if the degree of dilatation of the wrong cervix was estimated! If the vaginal septum causes obstruction during child-birth it can easily be divided between clamps.

In cases of uterus subseptus and uterus bicornis the child tends to lie transversely and a further complication may arise if the placenta is attached to the septum and the normal mechanism of separation of the placenta is impossible. The other complications, haematometra in an accessory cornu and ectopic gestation in an accessory cornu have already been mentioned. From time to time patients are seen who have passed through normal pregnancies and labours although the uterus is bicornuate so there is good reason to believe that a bicornuate uterus does not necessarily give rise to difficulty during child birth.

Aplasia and Hypoplasia

A complete failure of development of both Mullerian ducts is only possible if there is a simultaneous non development of the urinary system. Similarly unilateral aplasia is very rare and is represented by uterus unicornis. This anomaly is usually associated with some developmental defect of the urinary system.

Hypoplastic forms are more frequent. One of the best known examples is the foetal uterus, or, as it may be more accurately called the uterus bicornis rudimentarius solidus in which the uterus is not canalised and menstruation is impossible. Asymmetrical hypoplasia is seen typically in the uterus unicornis with rudimentary accessory cornu. An accessory cornu may be either solid or it may be canalised in which case, unless it communicates with the main cavity of the uterus its menstrual discharge is retained. In some cases of accessory cornu a fertilised ovum becomes implanted and gives rise to an ectopic gestation within a rudimentary cornu.

Symmetrical hypoplasia of the uterus, less severe in degree than that seen in uterus rudimentarius solidus, is seen in the infantile uterus and in the uterus which is termed the small adult uterus or the prepubescent uterus. In the new born the body of the uterus is relatively ill developed so that the cervix is the same length as the body. All grades of development between a uterus of this type and a normal adult uterus are known. In the hypoplastic uterus of the adult, the cervix is long, slender and conical with a small external os. The body of the uterus is smaller than normal and quite frequently is acutely ante flexed. In such cases the myometrium of the uterus contains relatively little plain muscle.

Hypoplasia Genitalis The clinical condition termed hypoplasia genitalis is well recognised, and is recorded as being primarily due to a functional insufficiency of the ovaries. The uterus is of the small adult type with a slender conical cervix, and the vagina is short and narrow. The vulva itself is small, the labia enclose only a small amount of fat and the perineum is depressed to produce what is termed a scaphoid perineum. Frequently the uterus is congenitally retroflexed sometimes it is acutely ante flexed producing a form called the cochleate uterus. The Fallopian tubes are relatively long, they show a well marked tortuosity, and the plicæ are ill developed. The ovaries are elongated and often lie higher in the pelvis than normally.

The onset of puberty is usually delayed and menstruation is frequently irregular, so that the menstrual cycle is drawn out to between six and eight weeks. Severe dysmenorrhœa is a frequent symptom and there is a tendency for such patients to be sterile. The patients are usually of the "petite" type with small bones and the pelvis is of the generally contracted type.

The clinical syndrome is easily recognised and such patients are frequently seen in gynaecological practice because of the attendant symptoms of dysmenorrhœa and sterility.

Vaginal Aplasia In some patients the vagina fails to develop along the whole of its length. Usually there is a depression in the situation of the hymen and the uterus, if present is either duplicated or rudimentary. In patients of this kind the ovaries may function normally although menstruation and sexual intercourse are impossible. From time to time patients are seen who wish to get married in whom the vagina is not developed. Some patients are willing to undergo operative treatment in order that an artificial vagina may be formed. Cases have been reported in which an artificial vagina was constructed and as the patient had a normal uterus she subsequently conceived and gave birth to children. It should be remembered, however, that in most cases of total absence of the vagina the uterus is ill developed so that conception is impossible. Several methods have been used in the construction of an artificial vagina.

Treatment

The modern method of fashioning an artificial vagina due, in this country, to McIndoe is not only extremely simple but gives

very good results. The patient is anaesthetised and placed in the lithotomy position. A vertical incision is made between the urethral orifice and the anus and then the space between the urethra and the rectum is opened up. The separation is quite easy. An obturator made of vulcanite, fashioned into the shape of the normal vagina, is now covered with razor grafts taken from the thigh, with the raw surfaces outwards and kept in place with mastisol. The mould is then placed in the space created between the rectum and the urethra and kept in place by means of occlusive stitches at the vulva. The obturator is kept *in situ* for nearly four months. Subsequently the vagina is kept dilated with glass vaginal obturators.

Older methods should be regarded as obsolete. In Baldwin's operation a loop of small intestine was brought down between the rectum and urethra, but the results obtained cannot compare with those of the modern method.

Epispadias is seen only rarely in women. There are different degrees of maldevelopments of the anterior wall of the urethra and bladder. In the mildest form the maldevelopment is restricted to the anterior parts of the labia minora and the clitoris, in some cases of this kind the symphysis pubis fails to develop giving rise to the condition known as split pelvis. In such cases owing to the wide separation of the levator ani muscles the patients may suffer from prolapse whether they have borne children or not.

Various plastic operations have been described to remedy the defect in the anterior wall of the urethra and to get rid of the symptom, incontinence of urine. Such operations make use of a Gillies tube flap, and Stoeckel has described a method for making a new sphincter muscle for the urethra by drawing down the two pyramidalis muscles together with attached pieces of the anterior sheath of the rectus muscles and suturing them together beneath the urethra.

Ectopia Vesicæ Ectopia vesicæ is seen infrequently in the female. In this condition there is an absence both of the anterior wall of the bladder and of the lower part of the abdominal wall. The symphysis pubis also fails to develop, as does the anterior wall of the urethra. In ectopia vesicæ the red mucous membrane of the bladder projects forwards in front of the anterior abdominal wall. The two ureteric orifices are visible and discharge urine, so that the patient is constantly wet. Treatment consists in implanting the ureters by Coffey's opera-

tion into the sigmoid colon and subsequently closing the bladder and repairing the anterior abdominal wall

Hypospadias Hypospadias is an extremely rare malformation in the female. The lower wall of the urethra fails to develop so that in extreme cases the bladder may open into the vagina

Malformations of the Rectum and Anus

Imperforate Anus This condition is due to failure of the cloacal membrane to break down between the anal depression and the intestine

Atresia Recti The lower part of the rectum fails to develop, and such cases are much more unfavourable to treatment than the relatively simple cases of atresia of the anus

Congenital Recto vaginal Fistulæ Various types of malformations of the rectum and vagina are due to imperfect separation of the rectum from the urogenital sinus. In some cases the anus may be represented by a depression in the normal position but the rectum opens on to the surface in the situation of the perineum. In other cases the lower part of the rectum ends partly by way of a normal anal canal and partly by way of a fistula opening on to the surface in the situation of the perineal body

Hermaphroditism and Pseudo hermaphroditism

In true hermaphroditism the glands of both sexes must be present in the same individual. Such cases are very rare. In the museum of St Bartholomew's Hospital there is a specimen obtained from an adult in whom the external genitalia were of the male type with normally developed penis and scrotum. Neither testis had descended into the scrotum and at post mortem examination the uterus masculinus was represented by a uterus which was larger than the normal adult uterus, while on each side of the uterus was attached an ovary. Examples of this kind are extremely rare, and in most cases the accessory sex gland is atrophic and shows no evidence of functional activity.

In other cases the sex glands have been found to consist partly of ovarian and partly of testicular tissue. Berlinger has described an example of a combined gland (ovo testis) in which follicles and corpora lutea as well as spermatogonia and spermatocytes were present. There is also reason to believe

that rare tumours of the ovary called arrhenoblastomata which give rise to virilism are derived from an ovo testis

In pseudo hermaphroditism the sex glands are of one sex, while the external genitalia resemble those of the opposite sex. The ovaries may descend within the inguinal canal to lie in the labia majora, and if the clitoris is hypertrophied the external

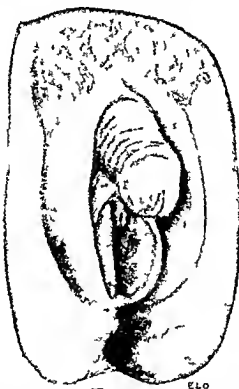


FIG. 60 Pseudo-hermaphrodite. A female pseudo-hermaphrodite with well developed penis. The patient was married and had had one miscarriage. (After Frankl.)

genitalia superficially resemble those of the male. This condition is best termed pseudo hermaphroditismus feminus externus. In the opposite type the testes fail to descend into the scrotum, the penis is ill developed, and as a result of an extreme degree of hypospadias the external genitalia resemble those of the female.

Cases of pseudo hermaphroditism may cause difficulty in deciding the sex of the individual. From time to time cases are seen in which the external genitalia are of the feminine type, but where menstruation does not develop, in which a testis may

be found either in an inguinal hernia or during an abdominal operation.

Cases of hermaphroditism and pseudo-hermaphroditism are rare and are of little clinical importance.

Malformations of the Fallopian Tubes

Some of the developmental defects of the Fallopian tubes such as aplasia, in which the Fallopian tube fails to develop, and atresia, in which the Fallopian tube is either partially or completely occluded, have already been described. In cases of hypoplasia, the tube retains the sinuous appearance seen in the foetus, and is relatively longer than the normal tube.

In addition to these malformations other defects of the Fallopian tubes are well recognised. Accessory abdominal ostia are seen fairly frequently, and in some cases two or three small ones can be demonstrated in the same Fallopian tube.

CHAPTER VI

SPECIFIC INFECTIONS OF THE FEMALE GENERATIVE ORGANS

GONORRHOEA

GONORRHOEA can be regarded as the best example of pelvic inflammation in women, for it produces lesions of the vulva, vagina, cervix, Fallopian tubes ovaries and the pelvic peritoneum. It is a disease which is often difficult to diagnose, it is resistant to treatment, and it produces important after effects.

The Gonococcus The gonococcus is a Gram negative intracellular non motile coccus found usually in pairs but sometimes in tetrads. The cocci are large, reniform in shape, and when found in pairs lie with their concave edges in close apposition. Quite often many gonococci are found in the same pus cell. The gonococcus is larger than the meningococcus and the micrococcus catarrhalis. Other Gram negative organisms are frequently found in the female genital tract, some of which are intracellular, but the gonococcus can readily be distinguished by its large size and reniform shape. It does not grow easily on culture media. The optimum temperature for growth is 36° C, and the medium must contain either fresh blood or serum. The colonies are small and semi translucent. It is difficult to grow the gonococcus from discharges obtained from the female genital tract, because the medium becomes overgrown with other organisms. It is much simpler to culture the gonococcus from the discharge from the male urethra than from any discharge obtained from the female genital tract. Experience shows that it is well nigh impossible to grow the gonococcus from vaginal discharges, and if efforts are made in suspect cases the discharge should be collected either from the cervical canal, the urethra, or from Bartholin's glands. The coccus is non pathogenic to animals. It shows no inclination to invade tissues deeply, but it is capable of attacking intact epithelium by producing a toxin which causes degeneration of epithelial cells. The squamous

epithelium of the adult vagina and the squamous epithelium of the skin are resistant to the gonococcus, but the delicate vaginal epithelium of children and the softened vaginal epithelium in pregnancy are much more readily attacked. Some of the worst cases of gonorrhœa and of gonococcal vaginitis are those seen when infection has occurred during the first coitus—the so called defloration gonorrhœa.

Distribution of Infection The primary sites of infection in acute gonorrhœa are the urethra and Skene's tubules, the vulva and Bartholin's glands, and the cervix. Acute gonococcal vaginitis is seen only in children, in defloration cases, and in infections with extremely virulent organisms. The following figures illustrate the distribution of the infection in acute gonorrhœa: urethra, 95 per cent, cervix, 80 per cent, endometrium of the body of the uterus 60 per cent, adnexa, 25 per cent. The infection is ascending in type and extends upwards from the cervix to the endometrium of the body of the uterus by direct spread along the epithelium. It may spread to the Fallopian tubes and it is well known clinically that acute salpingitis usually develops a few days after the cessation of a menstrual period. Pelvic peritonitis often develops in cases of salpingo-oophoritis and may lead to the formation of a pelvic abscess. A frequent result of gonococcal salpingitis is occlusion of the Fallopian tubes, either by adhesion of the tubal plicæ or by the formation of adhesions around the abdominal ostia. Peritoneal adhesions may cause the appendages to become fixed in the pouch of Douglas and to cause retroflexion of the uterus. The adherent appendages are extremely tender and cause severe dyspareunia. Just as gonococcal salpingitis often develops shortly after the cessation of the menstrual period so the infection may spread up to the Fallopian tubes during the puerperium, and many cases of one child sterility can be explained in this way. Gonococcal urethritis may be followed by the development of cystitis and very rarely by infections of the pelvis of the kidney. Gonococcal infections of the rectum are more frequent than is generally believed, and some authorities maintain that infection of the rectum can be demonstrated in one third of all acute cases. Cases of general peritonitis following upon gonococcal pelvic peritonitis are uncommon. Usually they present no difficulty in diagnosis for the constitutional disturbances are less severe than in any other type of general peritonitis and they are characterised by extreme rigidity of the

abdominal wall without well marked tenderness or distension. Gonococcal septicaemia is extremely rare, although cases are seen from time to time, and metastatic infections giving rise to endocarditis, meningitis and acute arthritis are again uncommon. On the other hand, chronic arthritis and chronic teno synovitis are frequently seen in cases of chronic gonorrhoea. Suppuration of the inguinal glands in acute gonorrhoea is not so common as in men.

In acute gonorrhoea all the primary sites of infection are not necessarily involved, and in multiparæ, when the vagina is patulous, the urethra may escape infection. In virgins and when the vagina is small or when penetration has been incomplete the urethra and Bartholin's glands alone may be involved, the cervix remaining free of infection. It is important to bear these facts in mind, for if local treatment is applied to a cervix or urethra not primarily infected, infection may be transmitted by contagion during treatment.

Symptoms—Acute Gonorrhoea in Adults

The symptoms of acute gonorrhoea develop within three days of infection and in defloration cases may arise immediately. The earliest symptom is a burning pain on micturition, after which the vulva becomes tender, inflamed and covered with sero purulent discharge. If the cervix is infected a profuse greenish yellow vaginal discharge develops. Inflammation of Bartholin's gland leads to local pain and tenderness, and if suppuration arises, well marked swelling and extreme pain result. If the cervix is acutely inflamed or if the infection involves the endometrium of the body of the uterus dull pain may be complained of in the lower abdomen and back. Acute salpingitis does not arise immediately after infection, but usually develops either a few days subsequent to the cessation of a menstrual period or during the 2nd week after the onset of symptoms.

Constitutional disturbances arise only in severe cases of acute gonorrhoea. Sometimes the virulence of the infecting organism is low, when the local symptoms may be slight, so much so that the patient may not suspect that she has become infected. Nevertheless, if such a patient is closely questioned, she will almost always give a history of some of the symptoms mentioned above.

Examination and Diagnosis

The diagnosis of gonorrhoea may be extremely difficult. A great responsibility rests upon any practitioner who has to give an opinion in a case of acute vaginal discharge. If he fails to diagnose gonorrhoea and the patient is not treated satisfactorily, severe complications such as sterility, ophthalmia neonatorum and reinfection of the husband may result. If, on the other hand, he makes the diagnosis of gonorrhoea when the symptoms are due to a simple leucorrhoea unjust accusations may be brought against the husband or consort and for this the practitioner must be judged responsible. It should be a principle amongst medical men, never to make the diagnosis of gonorrhoea unless the gonococcus has been demonstrated bacteriologically in the discharges. As much care should be taken over the history and in the examination of a patient suspected of having gonorrhoea as in any other type of case met with in gynaecological practice. A superficial examination of the patient in the left lateral position combined with the collection of discharge from the vagina cannot be regarded as a complete investigation of the case. The discharge will probably have dried by the time it reaches the laboratory and will be useless for bacteriological examination. Moreover, as has already been stated, it is extremely difficult, if not impossible, to demonstrate the gonococcus in the discharge obtained from the vagina of adult patients. A satisfactory examination can only be made with the patient lying in the lithotomy position, and if there is difficulty in persuading the patient to be examined in this way, there should be no hesitation in insisting upon an examination under anaesthesia.

The physical signs of acute gonorrhoea are as follows. The inner surfaces of the labia minora and in severe cases the labia majora as well, are reddened, swollen, tender, and covered with sero purulent discharge. The urethral meatus is swollen and reddened and discharges pus, while within the meatus the ducts of Skene's tubules are injected. Reddening of the ducts of Bartholin's glands was once regarded as pathognomonic of gonorrhoea, but in recent years less importance has been attached to this physical sign. Nevertheless, reddening of the ducts is found almost invariably in acute gonorrhoea, and if reddening of the ducts is produced by any other condition, such cases are very exceptional. In acute gonorrhoea Bartholin's glands can easily

be palpated between the finger and thumb in the tissues of the posterior part of the labia majora and by pressure upon the gland, purulent discharge can be expressed from the duct. The vaginal discharge is purulent in type and greenish yellow in colour. If the cervix is involved, pus or muco pus can be seen being discharged from the external os and the cervix itself may be swollen and injected. In some atypical cases of gonococcal cervicitis the cervix may appear normal and the discharge from the external os consist only of mucus. This fact should always be borne in mind. Fortunately, in such cases, the gonococcus can easily be demonstrated in the mucous discharge.

The diagnosis of gonorrhoea depends upon three factors —

(1) The history. The history of a burning pain on micturition and of vaginal discharge following upon sexual intercourse is always suspicious of gonorrhoea. It should be remembered, however, that a vaginal discharge frequently develops after defloration, as the result of minor injuries to the hymen and vagina.

(2) The presence of the characteristic local inflammations at the primary sites of infection.

(3) Most important of all, the demonstration of the gonococcus.

Collection of Material for Examination. The patient should be placed in the lithotomy position. Discharge should first be collected from the urethra. A finger is inserted into the vagina, the urethra massaged against the symphysis pubis so that any discharge present is expressed from the meatus. The discharge is best collected either in a platinum loop or in a small sterile spoon. If Skene's tubules are reddened secretion should be collected from them with a fine platinum wire.

Bartholin's glands should now be compressed between the finger and thumb, and if any pus is expressed from the duct it should be collected in the same way. A sterile speculum such as Cusco's or Fergusson's is now passed into the vagina, the cervix swabbed clear of mucus and discharge with a swab soaked in a weak solution of sodium bicarbonate and then dried with a sterile swab. Material is now collected from within the cervical canal either with a platinum loop or a throat swab.

Film preparations are now examined. Care should be taken in fixing the films, for if they are overheated it may be difficult to recognise the gonococcus. Satisfactory fixation can be

obtained by using a mixture of equal parts of ether and absolute alcohol for three minutes. Films should first be stained with carbol thionin for thirty seconds, then washed, dried and examined under an oil immersion. The advantage of carbol thionin is that it allows intracellular diplococci to be picked out easily and rapidly. If such organisms are present other films should be stained by Gram's method to determine whether the intracellular diplococci are Gram negative or not. If cultures are made, care should be taken to ensure that fresh material is used for inoculation and contamination must be avoided.

If the bacteriological examination proves negative and if there are strong clinical grounds for believing that the case is gonococcal in nature, the bacteriological examinations must be repeated at frequent intervals.

Gonorrhœa in Children Gonococcal vulvovaginitis is seen fairly frequently in young children. The disease is extremely contagious and spreads with alarming speed amongst the inmates of schools and institutions. Infection is transmitted by way of towels, bedding and bath water. In children, the infection rarely spreads above the level of the cervix, very occasionally a hydrosalpinx may be discovered later in life, but symptoms of acute salpingitis in children are hardly ever encountered. The infection produces a profuse yellow discharge from the vagina and vulva, the vulva is reddened and excoriated and the vagina acutely inflamed. In children, it is easy to demonstrate the gonococcus in smears taken from the vaginal discharge, and there is usually no difficulty in establishing the diagnosis. From time to time vulvovaginitis caused by the bacillus coli is seen, but the rarer conditions of diphtheritic vulvitis and noma vulvæ are easily distinguished.

Chronic Gonorrhœa in Adults In chronic gonorrhœa the infection remains dormant in the urethra, Bartholin's glands and the cervix. A chronic endometritis due to gonorrhœa is hardly ever seen, for the primary infection is usually restricted to the functional layer of the endometrium which is shed into the cavity of the uterus during each menstrual period, and in this way the infected material is drained away. It is very exceptional for the gonococcus to invade the basal layer of the endometrium or to spread into the myometrium of the uterus. In chronic gonococcal urethritis, the urethra is indurated, although it may be impossible to express pus from the meatus by urethral massage. It may be difficult therefore to establish

the gonococcal nature of chronic urethritis in the female. In most cases, however, the ducts of Skene's tubules are reddened and it is often possible to collect material for examination from them even when there is no discharge from the urethra itself. In some cases small abscesses develop in the paraurethral tissues and may point externally.

Chronic Bartholinitis gives rise to induration of the gland, which becomes palpable in the tissues of the labium minus. Bartholin's abscess is not restricted to acute cases for recurrent abscesses are not uncommon in chronic cases and they often discharge themselves spontaneously on the inner surface of the labium minus. Bartholin's cysts are distension cysts caused by occlusion of the duct. If the wall of a Bartholin's cyst is examined histologically it will be found to be lined mainly by squamous epithelium, and it is probable that most Bartholin's cysts arise by distension of the duct rather than of the gland proper.

Chronic gonococcal cervicitis causes a persistent discharge of mucus and pus from the external os. In most cases the cervix is eroded, but it must be borne in mind that an erosion of the cervix is far from being conclusive evidence of gonococcal cervicitis. It may be extremely difficult to demonstrate the gonococcus in cases of chronic gonococcal cervicitis, for it is not uncommon for secondary infections to overshadow the primary gonococcal infection, and many bacteriological examinations may be necessary before the diagnosis of chronic gonococcal cervicitis can be established. Chronic gonococcal infections of the uterine adnexa take the form of hydrosalpinx, pyosalpinx, interstitial salpingitis and tubovarian abscesses. Curtis has shown that the gonococcus cannot be demonstrated in the Fallopian tubes after an interval of six weeks from the primary infection. Pure gonococcal infections of the uterine adnexa do not therefore give rise to active inflammations of a chronic type. On the other hand, the appendages may be subsequently attacked by secondary infections so that active chronic inflammations may ensue. It has already been pointed out that reinfection from the consort, with recurrent attacks of salpingitis is not infrequent. As the result of gonococcal salpingitis, the appendages become surrounded with adhesions, and prolapse behind the uterus to become fixed either to the back of the uterus or to the pouch of Douglas. The uterus becomes retroflexed and the tender appendages, fixed in the pouch of Douglas, cause dyspareunia.

Chronic arthritis and chronic tenosynovitis are common complications of latent gonococcal infections and clear up rapidly when active treatment is applied to the source of infection in the pelvis.

Condylomata of the vulva may be caused by chronic gonococcal discharges. The majority of cases arise during pregnancy when the discharge is profuse. Condylomata of the vulva may be produced during pregnancy by severe leucorrhœa as well as by gonorrhœa. In most cases, no treatment except the use of astringent lotions and powders is necessary, and the condylomata usually retrogress after parturition. It is sometimes necessary to excise the condylomata. Condylomata of this kind are easily distinguished from those seen in syphilis.

Treatment

The treatment of gonorrhœa has been revolutionised by the introduction of drugs of the sulphonamide group. As a result many of the methods previously employed are now obsolete. Nevertheless the general treatment should be the same with acute cases. The patient should be encouraged to stay in bed during the first week of the disease. Rest is most important during the acute stage. Stimulants should be avoided and the patient should live as quietly as possible.

Chemotherapy. At the present time treatment with sulphapyridine is most favoured. Patients should be given between 2 and 4 gm. by mouth daily for one week. It is best to give half a tablet or one tablet four times a day after food. The exact dosage must vary with the individual case. If the attack of gonorrhœa is severe then as much as 4 gm. should be given during each day. On the other hand, if the patient is sensitive and develops nausea, a smaller dose is necessary. If the patient is resistant to the drug the larger dose is required. If the patient presents herself for treatment immediately after the disease has been acquired the chances are that a cure will be established during the first fortnight or even earlier, whereas if the patient presents herself late, the chances of early cure will obviously be reduced.

Sulphanilamide, although fairly satisfactory in treatment, is probably not so efficacious as sulphapyridine. With both drugs the immediate results are extremely satisfactory so far as permanent cure is concerned. In addition, the incidence of such

complications as Bartholin's abscess and salpingitis is greatly reduced. Relapse will be encountered with some cases when further courses of treatment will be necessary. With chemotherapy local treatment is unnecessary during the first week except that the vulva should be swabbed and irrigated with a mild antiseptic solution such as hydrogen peroxide. Large quantities of bland fluids should be taken and alkaline diuretics such as citrates must be administered to keep the urine alkaline. In the acute stage vaginal irrigations and the application of antiseptics to the cervix and urethra should be avoided partly because they are unnecessary and partly because the infection may be transmitted from the region of the vulva to the cervix and even to the endometrium of the body of the uterus. With chronic cases vaginal douches combined with the application of antiseptics to the urethra and to the cervix should be carried out. Vaginal douches should be given at least four times each

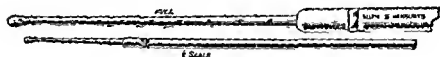


FIG. 61 Playfair's probe

day. The patient should lie on her back with the pelvis raised on a douche pan and the vaginal irrigation should be carried out slowly. The purpose of the irrigation is not to attack the primary sites of infection, the douche is intended to irrigate away the discharges which have collected in the vagina. Various solutions are used for vaginal irrigation e.g., silver nitrate 1 in 2,000, alum 60 grains to the pint, and permanganate 1 in 5,000. The urethra should be swabbed out at least once every day with some silver preparation such as 20 per cent protargol or 3 per cent silver nitrate. It is most convenient to place the patient in the lithotomy position for treatment of this kind. Small pieces of cotton wool are wrapped round thin sticks of wood, the wool soaked in the solution used, then inserted into the urethra and gently rotated round. Irrigation of the urethra with dilute antiseptic solutions such as permanganate 1 in 5,000 is also carried out at some institutions. Local treatment to the cervix consists in exposing the cervix with a speculum, swabbing it clear of mucous discharge, and then applying a strong antiseptic to the cervical canal. The best form of swab to use is again a thin piece of wood with a small piece of cotton wool

wrapped around its end. Many antiseptics have been used in the treatment of gonococcal cervicitis. The best of all is iodised phenol but strong solutions of iodine, formalin, silver nitrate (5 per cent), picric acid in spirit (3 per cent), are extremely useful. It is often difficult to clear away the mucus from within the cervical canal except by swabbing it away with an alkaline solution of 1 dram of sodium bicarbonate to the pint of water. The application of antiseptics to the cervical canal should be made at least once every day, and a convenient method is to use small pencils, made up of the antiseptic incorporated in a convenient base like gum arabic, and to insert one of these pencils into the cervical canal keeping it in position with a little gauze packed into the upper part of the vagina.

Treatment of Complications. With acute salpingitis chemotherapy must be carried out more intensively and in addition the patient should be given frequent hot vaginal douches and heat should be applied to the lower abdomen in the form of hot fomentations and antiphlogistine. With Bartholinitis the condition may subside under the influence of sulphapyridine. If the abscess persists it must be incised under anaesthesia. A large T shaped incision is made on the inner aspect of the labium minus. It is essential to open up the abscess widely, and during the after treatment the abscess cavity must be packed with gauze so that healing takes place from below otherwise sinuses are apt to develop. Bartholin's cyst should be treated by excision under anaesthesia. A general anaesthetic should always be used. It is a mistake ever to remove a Bartholin's cyst under local anaesthesia, for the cyst is attached anteriorly to the erectile tissues around the vagina so that after the effect of the local anaesthesia has passed away severe reactionary hæmorrhage may arise from the wound. In such cases the hæmorrhage is extremely severe. In the operation of excising the Bartholin's cyst the incision is best made on the outer surface of the labium majus otherwise painful scars giving rise to dyspareunia may be formed at the vaginal orifice. If the cyst is thick walled it can be excised completely, but thin walled cysts are often adherent to the labium minus and rupture during removal. Care should be taken to excise the whole of the cyst and the rest of Bartholin's gland, otherwise sinuses may form and even recurrent abscesses may develop.

The treatment of gonorrhœa in pregnancy should consist of

the administration of sulphapyridine. If a chronic condition persists vaginal douches consisting of $\frac{1}{2}$ per cent lactic acid in water should be used to irrigate away the vaginal discharge. The application of antiseptics to the cervical canal should be carried out with extreme care because of the risk of rupture of the membranes.

Treatment of Chronic Refractory Cases Sometimes chronic cervicitis persists after an attack of acute gonorrhœa. In some cases secondary infections have attacked the cervix, a vaginal discharge is complained of by the patient, and the cervix is found to be eroded with mucus being discharged through the external os. In these cases there is not much response to chemotherapy nor may the application of antiseptics be of much help. Improvement often follows treatment with diathermy and even ionisation. Diathermy treatment is used also for chronic urethritis and chronic salpingo oophoritis. In chronic cervicitis if no response is obtained it may be necessary to treat the cervix by partial amputation. Diathermy treatment of the cervix is particularly useful in cases of chronic arthritis and teno synovitis.

Treatment of Vulvovaginitis in Children These cases are now treated with sulphapyridine. The dose varies with the age of the child. Immediate improvement follows upon the administration of sulphapyridine, and it is usual to employ the treatment for only about a week. In addition, œstrin should be given by mouth because the hormone produces thickening of the vaginal epithelium which makes the vagina more resistant to infection. During the acute stage of the disease local treatment should consist in the use of medicated baths. Vaginal irrigations should be restricted only to chronic cases. To carry out the vaginal douche the nurse should insert a small rubber catheter into the vagina. Local treatment of the vagina and cervix is unnecessary at the present day. In some institutions vaccines are used for cases of this kind. It should be remembered that vulvovaginitis in children requires isolation of the patient in a special hospital. Children should be removed from risk of re infection.

Evidence of Cure One of the most difficult questions to be answered during the treatment of gonorrhœa is whether the patient can be considered cured. No patient should be regarded as cured of gonorrhœa unless no gonococci can be demonstrated in six smears taken from the cervix at intervals of three or four

days. Other tests of cure are used. It is well known clinically that latent gonorrhœa is lit up by the application of strong chemicals to the cervical canal, by menstruation and by coitus. A 5 per cent silver nitrate solution should be applied to the cervical canal, and if gonococci cannot subsequently be demonstrated in five preparations made on five different days from the secretion within the cervical canal, the patient can be considered cured. Hydrogen peroxide is used by some authorities instead of silver nitrate. Not until these tests are negative for gonococci should coitus be allowed.

TUBERCULOSIS OF THE FEMALE GENERATIVE ORGANS

Tuberculosis of the female generative organs is always secondary to some primary focus existing elsewhere in the body. There is no reason to believe that the infection is ever ascending in type, or that it results from insemination from an infected male. Just as tuberculosis of the urinary system is a descending infection, so tuberculosis of the female genital tract is of the same type. Genital and urinary tuberculosis must be regarded as independent, if present simultaneously, the infections are coincident, for there is no evidence that transmission of infection by direct spread from one system to the other is possible. Tuberculosis of the female generative tract is more frequent than is generally believed, and in a series of over 3 500 post mortem examinations infection of the genital tract was found in 3.5 per cent, of the peritoneum in 5 per cent and of the urinary tract in 1.5 per cent. On the other hand, latent tuberculosis of the female genital tract does not usually give rise to symptoms, so that cases of tuberculosis in the female genital tract which require treatment are not very common.

The majority of cases of tuberculosis of the female genital organs are caused by descending infections from the peritoneal cavity. In tuberculous peritonitis the infected material falls into the pelvis and involves the Fallopian tubes and ovaries. In this way the three types of tuberculous peritonitis, namely, the miliary, adhesive and the caseous, are represented in tuberculous salpingo oophoritis. In this method of spread the infection is usually of the bovine type emanating from infected mesenteric glands. In other cases, the tubercle bacillus reaches

the Fallopian tubes and ovaries by way of the blood stream. In one form of tuberculous salpingitis the tubercles are restricted to the mucous membranes of the Fallopian tube and form a primary tuberculous endosalpingitis. Comparable cases of primary tuberculous endometritis are seen from time to time, and both types of case are explained by assuming a blood stream infection. Tuberculosis is more frequent in the Fallopian tubes than in the ovaries. Next in order of frequency comes the

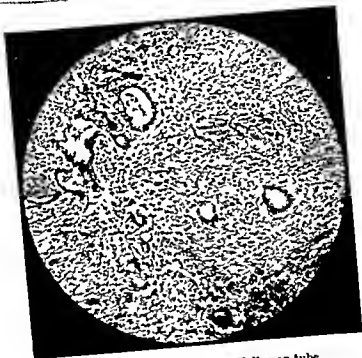


FIG. 62. Tuberculosis of the Fallopian tube

endometrium of the uterus, then the cervix, and lastly, the least frequent of all, tuberculosis of the vulva.

Tuberculosis of the Fallopian Tubes and Ovaries. Cases of tuberculosis of the Fallopian tubes and ovaries can be grouped into three types: the miliary, the adhesive, and the caseous, and this classification illustrates the relation of tuberculous disease of the uterine appendages to tuberculosis of the peritoneum. A more accurate classification is to distinguish between primary endosalpingitis and primary perisalpingitis. From the clinical point of view, the blood stream infections which give rise to tuberculous endosalpingitis are the more

important, for the other cases are overshadowed by the symptoms of the primary tuberculous peritonitis

In tuberculous endosalpingitis tubercles are distributed amongst the tubal plicæ and are recognised microscopically by their giant cells, endothelial cells and peripheral round celled infiltration. The tubercles discharge caseous material into the lumen of the tube, so that eventually the tube becomes converted into a pyosalpinx and quite often extremely large swellings develop. The wall of the tube is thickened, and in advanced cases tubercles can be identified on the peritoneal surface. Dense adhesions form between the Fallopian tubes, ovaries, uterus and intestines and fix the appendages in the pelvis. Tuberculous pyosalpinx is distinguished from gonococcal pyosalpinx by the caseous nature of the contained material, by the presence of tubercles on the surface and by the denseness of the surrounding adhesions. In some cases of tuberculous endosalpingitis in which infection is restricted to a limited portion of the Fallopian tube, the infected area becomes shut off during the process of healing and the end result is a collection of caseous material surrounded by fibrous tissue. These swellings are known as pseudo-dermoids of the Fallopian tube. In other cases, healing of a tuberculous area in the endosalpinx leads to fibrosis and thickening, and sometimes the mucous membrane of the Fallopian tube burrows into the muscle wall producing a form of adenomyoma usually referred to as *salpingitis isthmica nodosa*.

Primary tuberculosis of the ovary is relatively uncommon compared with tuberculous salpingitis, but the ovary is often involved in cases of large tuberculous pyosalpinges, when tuberculous tuboovarian abscesses and small tuberculous abscesses develop in the ovary. In tuberculous salpingo-oophoritis the tube and ovary are matted together by dense adhesions, and in addition to the tuberculous pyosalpinx, tuberculous abscesses are scattered in the substance of the ovary. Tuberculous disease of the uterine appendages of this kind is characterised by dense adhesions, not only to the back of the uterus but also to the sigmoid, the cæcum and appendix, the small intestine and the omentum. In such cases very large swellings may be produced.

Tuberculosis of the uterus usually involves the endometrium of the body. Such cases are, however, rare, and most cases are seen in patients after the age of the menopause. In advanced

cases the caseous material collects in the cavity of the uterus to produce a pyometra

Tuberculosis of the cervix is rarely seen in this country, although it is more frequent in Italy and in Central Europe. Tuberculosis of the cervix causes ulceration while the deeper tissues of the portio are hypertrophied. The tuberculous ulcer is indurated, but does not bleed so vigorously as the ulcerative form of carcinoma of the cervix. The differential diagnosis between tuberculosis and carcinoma of the cervix may cause difficulty, and it is usually necessary to perform biopsy before the diagnosis can be established.

Tuberculosis of the vulva is very uncommon. Two forms have been described, the ulcerative and the hypertrophic. In both cases the diagnosis is difficult unless biopsy is performed. The ulcerative type must be distinguished from syphilitic ulceration, while in the hypertrophic form, large swellings are produced which resemble such conditions as elephantiasis of the vulva. Tuberculosis of the vulva is probably caused by hæmatogenous infection, although some cases may perhaps be secondary to tuberculosis of the bladder and rectum.

† **Diagnosis.** The diagnosis of tuberculosis of the female genital tract is not usually made prior to operation. Most patients are young, between the ages of 20 and 25, although tuberculosis of the endometrium of the cervix and vulva sometimes develops in patients of post menopausal age. Tuberculosis of the Fallopian tubes and ovaries is again sometimes seen in patients of menopausal age, but such cases are exceptional.

In most cases of tuberculosis of the female genital tract there is some degree of hypoplasia genitalis, the vulva, vagina and uterus being ill developed. The effect of the disease on the menstrual cycle varies in individual cases. It is very rare for both ovaries to be completely destroyed by caseous involvement, but amenorrhœa is a common symptom because of the effect of the disease upon the general health of the patient. Menorrhagia has been described in some cases of tuberculous salpingo-oophoritis, but it is a very rare symptom. The symptom which causes the patient to seek medical advice is almost invariably a severe continuous pain felt in the lower abdomen. The pain is not related to menstruation or to movement, but is continuous and felt to one or other side of the midline.

On examination, a swelling is found in the situation of the uterine appendages which is fixed and indurated, but not so

tender as in cases of pyogenic salpingo oöphoritis. In some cases a craggy consistence can be detected similar to that felt in cases of tuberculous epididymitis. The most important local pelvic sign of the tuberculous nature of the swelling is the detection of co-existent small nodules in the pouch of Douglas and on the back of the uterus. It is often possible to detect thickening of the peritoneum in the pouch of Douglas by examination through the posterior fornix. It should be remembered, however, that nodules of this kind must be distinguished from those found in cases of ovarian carcinoma and pelvic endometriosis. If the tuberculous involvement of the uterine appendages is associated with tuberculous peritonitis, caseous masses may be detected in the right iliac fossa on abdominal examination.

At other times the tuberculous nature of the infection of the uterine appendages may be suspected from the general condition of the patient. If the patient has well marked signs of pulmonary tuberculosis, or if there has been extreme wasting or if the patient has the facies of tuberculosis, tuberculous infection of the appendages should be suspected. Lastly, well marked pyrexia is not characteristic of tuberculous salpingo oöphoritis, and if a patient with an adnexal swelling has well marked tenderness with pyrexia, it is unlikely that the infection of the appendages is tuberculous in type.

Treatment. The operative treatment of tuberculosis of the uterine appendages is often followed by severe complications. Tuberculous adhesions between the appendages and intestines have to be broken down during removal of the appendages, and if tubercles have spread along these adhesions to involve the bowel wall, intestinal contents may leak into the peritoneal cavity as the result of the operation. General peritonitis following upon the removal of tuberculous appendages is therefore not uncommon, or a faecal fistula may develop and persist until the tuberculous processes in the bowel wall have healed. Persistent sinuses leading down to the tuberculous area in the pelvis may also result from the operation. If the diagnosis of tuberculous salpingitis is made prior to operation in a young patient, and if the swelling of the appendages is small, such as to suggest the absence of caseous abscesses, the case should be treated conservatively by sanatorium treatment, by the injection of tuberculin and by artificial sunlight. Small doses of X rays applied to the pelvis are often extremely beneficial for cases of

this kind. There should never be hesitation in giving a dose of X rays sufficient to produce an artificial menopause even in young women with tuberculous salpingo oophoritis, for it should be remembered that if such patients are operated upon it is usually necessary to remove both Fallopian tubes and ovaries. Operation should not be advised in those cases in which there are extensive primary lesions of the thorax. therapy should be directed towards the primary lesion rather than to the secondary areas in the pelvis.

The majority of cases of tuberculous salpingo oophoritis are recognised as such only at laparotomy. Some surgeons have no hesitation in closing the abdomen if the patient is young and the disease not extensive, preferring to treat the patient conservatively. If, on the other hand, large swellings are found or if caseous abscesses of the tube or ovary are present, the tube and ovary must be removed. Extreme care must be taken in breaking down adhesions and every effort should be made to avoid injuring the bowel. Silk should never be used for ligature material as it may cause a persistent sinus, and drainage of the pelvis should be avoided for the same reason. If the complications, general peritonitis and faecal fistula do not develop, the end results of the surgical treatment of tuberculous appendages are good, but conservative anti tuberculous treatment must be vigorously applied during and after convalescence.

Tuberculosis of the endometrium is best treated by abdominal hysterectomy, tuberculosis of the cervix by vaginal hysterectomy, while tuberculosis of the vulva requires either excision or local treatment with X rays.

CHAPTER VII

DISEASES OF THE VULVA

VULVITIS

THE majority of inflammations of the vulva are secondary to disease of the vagina and uterus. Most cases of vulvitis are caused through such vaginal discharges as are seen in leucorrhœa, gonorrhœa, suppurating growths of the uterus and in urinary fistulæ. Similarly, the perianal inflammation caused by pruritus ani and hæmorrhoids frequently spreads anteriorly to involve the vulva.

Primary Vulvitis

Primary vulvitis is relatively uncommon. The vulvitis may be attributed to some form of trauma, such as the injuries caused by the tearing of the hymen during sexual intercourse and by masturbation, the injuries becoming infected and leading to inflammation of the vulva. Masturbation causes enlargement of the labia minora which project as long thin excrescences between the labia majora. In most cases the sebaceous glands on the inner surfaces of the labia minora are thickened and conspicuous to the naked eye. It should be remembered that the orgasm of masturbation leads to secretion of mucus from the cervix and Bartholin's gland. Patients are seen from time to time who complain of a mucous discharge, but show no evidence of such discharge on examination. The possibility that masturbation is the cause of the discharge should be borne in mind when such cases are investigated.

Gonococcal vulvitis is the best example of a primary vulvitis caused by infection. The condition is represented by the vulvovaginitis of children and is seen from time to time in adults when the labia become swollen, reddened and covered with a sero-purulent discharge.

Acute inflammations of the vulva are seen in furunculosis caused by infection of hair follicles. Small pustules of this type are extremely painful and are best treated by the application of

tincture of iodine Labial abscesses may form as the result of the furunculosis, they are treated by incision and drainage

Skin diseases such as eczema, erysipelas and psoriasis are rare Intertrigo, which is more common, usually spreads to the vulva from the genito crural folds The disease is seen usually in fat women when sweat accumulates between the folds of skin and causes maceration of the squamous epithelium The skin becomes inflamed and there may be spread of the dermatitis to the vulva and to the thighs

Gangrenous vulvitis is rarely seen at the present day It develops during the course of specific fevers when it produces extremely severe general toxæmia

Noma vulvæ arises in children during the course of specific fevers It is a rare disease in which the prognosis is grave In gangrenous vulvitis and in noma vulvæ the affected area must be excised and the surrounding tissues cauterised with strong antiseptics

Diphtheritic vulvitis is sometimes seen in children when the vulva becomes inflamed and covered with small pieces of membrane The Klebs Löffler bacillus can be demonstrated in the membrane The patient should be treated with anti diphtheritic serum The local treatment is to apply strong antiseptics

Secondary Vulvitis

Secondary vulvitis is far more frequent than the primary form, and may be conveniently regarded as the result of affections of the urinary tract, of discharges from the vagina, and of affections emanating from the anus and rectum

The most important and most frequent form of chronic vulvitis is that caused by diabetes mellitus Such cases are important, for quite often the earliest symptom of diabetes is the development of vulvitis Several factors are probably responsible for the development of diabetic vulvitis In the first place, the urine which dries on the vulva deposits glucose upon the skin Micro organisms find this environment suitable for their growth, so that infections with thrush and monilia are very common, particularly if small abrasions have been caused by scratching Another factor, perhaps the most important of all, is the diminished resistance of the diabetic tissues to infection, so that if small abrasions are produced, they become infected with organisms of low virulence The earliest symptom of the

vulvitis of diabetes is pruritus, and as the result of the patient scratching the vulva, the unhealthy epithelium receives minor injuries which become infected. The skin of the vulva becomes reddened, swollen and tender, further scratching being thereby induced. The small abrasions exude discharge in which the *oidium albicans* and even pyogenic organisms multiply. In advanced cases the inflammation involves the whole of the vulva and extends along the inner aspects of the thighs and around the anus. In diabetic vulvitis, the appearance of the vulva is characteristic, and the diagnosis can be made immediately. The characteristic features are the wide extension of the inflammation around the vulva, the production of scales of coagulated discharge on the surface, the peculiar grey colour of the skin of the labia majora caused by thickening of the horny layer of the epidermis, and lastly the development of small ill defined ulcers over the labia minora.

Extremely severe vulvitis is seen in cases of urinary fistulæ, when the continuous discharge of urine over the vulva leads to maceration of the skin. The vulvitis may spread and involve the skin around the anus and along the thighs.

Vaginal discharges are common causes of vulvitis, the vaginal discharges of leucorrhœa, gonococcal cervicitis, retained pessaries, carcinoma of the cervix being frequent examples. A minor degree of vulvitis is sometimes seen in cases of polymenorrhœa when the vulva is frequently bathed with the blood stained discharge from the uterus.

The vulvitis caused by leucorrhœa, particularly the type associated with trichomonad infections of the vagina, is quite often severe and particularly involves the vestibule and the inner surfaces of the labia minora which become reddened and tender, and in some cases small superficial ulcers are produced. It is only rarely, in this type of case, that the inflammation spreads to the labia majora. Vulvitis due to leucorrhœa is fairly common in pregnancy when the tissues are hyperæmic and the epithelium softened and less resistant to infection. An extreme form is sometimes produced by post partum leucorrhœa, when as the result of scratching and the infection of abrasions the vulvitis may spread and involve not only the outer surface of the labia majora but also the inner aspects of the thighs. The vulvitis caused by leucorrhœal discharge is easily recognised by the presence of the characteristic vaginal discharge. Cases of this kind are often resistant to treatment. The leucorrhœa

must first be cleared up before it is possible to obtain a cure of the vulvitis.

The vulvitis caused by the vaginal discharges both of gonococcal cervicitis and of leucorrhœa may lead to the formation of condylomata at the vulva. Such condylomata must be distinguished from the condylomata of syphilis which are usually more flattened and are associated with small ulcerations. Condylomata caused by gonorrhœa and by leucorrhœa are seen most frequently during pregnancy. It is important to remember that condylomata of this kind are not necessarily the result of gonorrhœa. In most cases the condylomata retrogress after



FIG 63. Condylomata accuminata of the vulva

parturition, but they may persist and give rise to large offensive cauliflower-like excrescences which involve not only the labia majora but may spread around the anus and even to the genito-crural folds. Small condylomata are treated by cauterisation with silver nitrate and by the application of astringent lotions; large pedunculated condylomata must, however, be removed by excision.

Vulvitis may be caused by the peri-anal dermatitis resulting from such conditions as oxyuris infections, pruritus ani, hæmorrhoids and anal fissure spreading anteriorly to involve the vulva. It is not uncommon to see patients in whom treatment of vulvitis has failed, when the primary cause has been some disease of the anus or anal canal.

Diagnosis

In most cases the cause of the vulvitis can be detected without difficulty. The urine should always be examined for sugar and pus, and its reaction to litmus determined. Care must be taken to exclude diseases of the anus and anal canal and in cases of vaginal discharge bacteriological examinations must be made from the cervix to determine whether the cause of the discharge is gonorrhœa.

Treatment

The cause of the vulvitis must be found and treated before local applications can be of service. Most cases of vulvitis respond very well to treatment if the cause has been found and treated, and if the local treatment is carried out carefully and continuously. Fadures are usually due to careless application of lotions and ointments. Patients often have difficulty in applying ointments to the vulva themselves, and it is always a good plan for a nurse to instruct the patient exactly how the applications should be made. The pubic hair and the hair covering the labia majora must be cut and when possible the vulva should be shaved. Such conditions as furunculosis and Bartholin's abscess must be treated by incision and drainage. In the vulvitis caused by intertrigo, the affected areas must be washed and dried and then powdered with a simple zinc powder. The vaginal discharge of gonorrhœa must be dealt with by appropriate treatment of the disease. Leucorrhœa is treated by frequent vaginal douches of $\frac{1}{2}$ per cent lactic acid in water, and, as with all vaginal irrigations, the irrigation should be slow.

The patients should be instructed to take frequent warm baths, and it is a good plan to paint the vulva carefully with silver nitrate solution 1 in 1,000. The application should be made with a brush by a doctor or nurse and should be repeated three times each week. A useful method is for the patient to apply to the vulva lint soaked in such astringent solutions as zinc sulphate 1 in 500 or copper sulphate 1 in 1,000. The lint can be kept in position with the help of a diaper and waist band, and the lint should be kept wet with the astringent solution during the course of the treatment. In mild cases of vulvitis, particularly in the type caused by leucorrhœa, it is better to keep the vulva dry with the help of zinc powders and pastes,

and it is a good plan to tamponade the vagina at night to prevent the vaginal discharge from coming in contact with the vulva. Some of the best results are obtained by the application of spirit to the inner surfaces of the labia and to the vestibule. It will be found that strong solutions of spirit cause extreme smarting and patients are unable to bear the application unless the spirit is first diluted with water. The strength of the spirit should gradually be increased until the patient can tolerate the application of pure spirit. In other cases, ointments are of service. Zinc ointments, carbolic acid ointment (3 per cent), and menthol ointments (5 per cent) are useful. Cocaine ointments should be used with caution particularly if the vulvitis is extensive and the skin is much inflamed. If the vulvitis is due to a seborrhœic dermatitis remarkable improvement follows upon the use of Castellani's fuchsin paint although in severe cases a preliminary small dose of X rays may be necessary. In all cases of vulvitis it is important to ensure that the patient sleeps well at night. Vulvitis is aggravated by scratching, and although patients may exercise sufficient self control during the day to avoid scratching the vulva, unconscious scratching at night may be uncontrollable. Hypnotics should therefore be given freely and the best results follow the administration of chloral hydrate. In refractory cases of vulvitis it may be necessary to give either X rays or radium treatment.

Pruritus Vulvæ Leucoplakia Vulvæ Kraurasis Vulvæ

Pruritus Vulvæ The symptom pruritus is present in most cases of vulvitis, particularly in those due to diabetes and leucorrhœa. In addition to cases of vulvitis there is a well recognised type of case in which no local cause for the pruritus is discoverable. Such cases are common and are usually referred to by the terms *idiopathic* or *nervous pruritus vulvæ*.

In all cases of pruritus vulvæ an effort must be made to find a local cause. Such conditions as diabetes, leucorrhœa, pruritus ani and those other conditions which have been dealt with in the previous section must all be excluded before the diagnosis of idiopathic pruritus vulvæ is made.

The ætiology of idiopathic pruritus vulvæ is unknown. Quite often the pruritus is aggravated during menstruation, and many cases are seen in women of menopausal age. A pruritus of a comparable type is not infrequent during pregnancy when it

is usually regarded as a manifestation of pregnancy toxæmia. Pruritus becomes aggravated when the patient is run down or burdened by home worries. It is always best marked when the patient is in bed, partly because of the warmth and partly because her attention is more concentrated on the pruritus than when she is up and about and has more interests. In severe cases the itching is constant both by day and night, and leads to severe scratching with subsequent damage to the skin of the vulva. The general health may suffer from the constant and intolerable annoyance of the irritation and patients may even become suicidal. There is hyperkeratosis of the skin of the



FIG. 64 Late stage of pruritus vulvæ, showing atrophy of epithelium and hyaline change in the stroma.

labia which becomes greyish-white in colour and produces an appearance which is almost pathognomonic. In severe cases the hyperkeratosis may spread to involve the inner aspects of the thighs. In late cases the epithelium atrophies and hyaline changes can be demonstrated in the stroma. The labia become swollen, but it is exceptional to find signs of an active vulvitis with reddening and tenderness.

The diagnosis of idiopathic pruritus vulvæ must be made with caution, for primary local causes must be carefully excluded before the diagnosis is justified.

Treatment. Pruritus vulvæ does not always respond to the usual methods of treatment and good results are often difficult to obtain. Pruritus vulvæ is a curious disease, for there is some evidence that it may clear up spontaneously, and the good results attributed to particular methods of treatment may perhaps be sometimes coincident. Strict cleanliness is the first

essential and in some cases frequent hot baths are of service, although recurrence of the pruritus after the patient comes out of the bath is not uncommon. Warm alkaline baths have been advocated from time to time. One of the most important essentials is to ensure that the patient obtains deep sleep at night, and, as in vulvitis, hypnotics must be freely used during treatment, for unless the patient sleeps deeply, there is a tendency for involuntary scratching, and the more the skin of the vulva is damaged the more marked is the symptom of itching. Various local treatments are used. Ointments of 3 per cent carbolic, 5 per cent menthol, and 5 per cent cocaine have been used. It is best, however, to follow a strict routine. At first the vulva is painted carefully three times a week with a solution of 1 in 400 silver nitrate. Most patients with idiopathic pruritus vulvæ are able to bear a solution of this strength. If it causes too much discomfort it can be diluted with distilled water. A large number of cases improve at once under this form of treatment. If, at the end of a fortnight the pruritus is unreheved, an ointment containing resorcin is used, best in the form of the Ung. Resorcin Co. of the B.P. Codex, and this treatment is used for a further fortnight. If the pruritus remains unaffected, the patient is then instructed to paint the vulva with a solution containing biniodide of mercury 1 part in 1,000 of spirit. If patients are unable to bear the application of strong spirit, the solution can be diluted with water, and after a time, when the patient has accustomed herself to spirit applications, it will be possible to use the concentrated solution. This solution should be applied two or three times every day. Various proprietary preparations some times prove to be of the greatest value in the treatment of idiopathic pruritus vulvæ. Cycloform ointment is always very useful and if dry powders can be tolerated better than ointments, Anæsthesin is recommended. Martindale's Ether Soluble Tar paste is very helpful while Resinol ointment sometimes acts almost specifically.

Pruritus of the vulva is often met with in women of menopausal age. It has been found that these cases respond to the administration of œstrin. It is well known that the skin of the vulva undergoes involution at the time of the menopause, and while this process is in progress the pruritus is complained of.

Such cases respond admirably to treatment with œstrin and

daily doses of from 1 to 5 mgm of stilboestrol should be given. It should be emphasised that the treatment is only suitable for menopausal cases • it is useless if the patient is not of menopausal age. There is also good reason to believe that the hormone can be administered percutaneously with satisfactory results. Estroglandol and Folipex ointments are prescribed for the treatment of cases of this kind.

With these methods of treatment the results are good, but occasionally cases are seen when there is no response to any local application. Such patients must then be treated either by the application of a radium plaque or by the use of X rays. The dosage of radium is of the order of 150 mgm applied to the vulva for seven minutes. The dose of X rays is 30 per cent of the skin dose using an aluminium filter 1-2 mm in thickness, and the dose should be repeated after an interval of a fortnight. It should be remembered that the effects of radiological methods of treatment are not immediate, and that seven weeks may elapse before the symptoms clear up completely. Some cases are encountered from time to time in which all local methods of treatment fail, when it may be necessary to excise the vulva.

Leucoplakia Vulvæ

Leucoplakia vulvæ is a pathological condition in which the skin is thickened and indurated and patches of white skin are scattered irregularly over the vulva. The affection usually involves the labia majora, and in advanced cases may surround the anus and spread along the inner aspects of the thighs. The labia minora, the vestibule and the vaginal orifice are not involved. The disease must be distinguished from vitiligo or leucoderma, a form of achromatosis of the vulva in which the same distribution is found but in which there is no thickening of the epidermis.

✓ In leucoplakia the stratum corneum is thickened and the rete Malpighii undergoes hyperplasia, so that the papillæ penetrate deeply into the cutis vera. Inflammatory reaction can usually be demonstrated in the cutis vera, which probably represents the reaction of the tissues to infection of the epidermis. There is no relation between leucoplakia of the vulva and syphilis. Leucoplakia vulvæ is a form of hyperkeratosis and is comparable to the hyperkeratoses found in other parts of the body. It is well established that carcinoma of the vulva may arise in areas

involved by leucoplakia. On the other hand, there is no reason to believe that previous leucoplakic changes are always necessary before carcinoma of the vulva can develop.

Leucoplakia vulvæ may persist in its original form of hyperkeratosis or it may develop into the condition kraurosis vulvæ when the superficial horny cells desquamate and the vulval epithelium becomes represented by a thin shrunken parchment-like membrane. Leucoplakia of the vulva usually arises in patients of post-menopausal age. It must be differentiated from vitiligo, from carcinoma of the vulva, and from kraurosis vulvæ. In leucoplakia the distribution of the induration is



FIG. 65. Leucoplakia of the vulva showing hyperkeratosis

typical, the labia majora being mainly involved, and the vestibule and urethra being unaffected. The scattered patches of thickened white epithelium are very characteristic of the disease. In cases in which carcinoma of the vulva arises in pre-existing leucoplakia it is usually found that cracks and fissures have first formed in the affected area; if such conditions are found an early carcinoma of the vulva should be suspected.

The symptoms of leucoplakia are local discomfort, pruritus and discharge. The prognosis depends upon the incidence of the two complications: carcinoma and kraurosis vulvæ. In some cases of leucoplakia vulvæ the disease remains stationary.

Treatment. If the disease remains stationary, efforts should

be made to treat the condition by the local application of ointments, by ultra violet light, and by X rays treatment. If there is any suspicion of the development either of carcinoma or of kraurosis vulvæ the vulva must be excised. This method of treatment may also be necessary in stationary cases when more conservative methods have failed.

Kraurosis Vulvæ

This condition is described as a form of atrophy of the vulva affecting the inner surfaces of the labia majora, the labia minora, the clitoris region and the fossa navicularis, in rare cases the condition has been known to spread to the perineum and the perianal region. The vagina and the outer surfaces of the labia majora are not involved. When the disease is well established the affected area is covered by thin parchment like skin which is either bluish grey or whitish grey in colour. Scattered over this area are prominent bright red vascular areas, and in some cases small ulcerations as well. In the late stages of the disease there is well marked atrophy of the inner part of the vulva, particularly of the vaginal orifice, so that coitus finally becomes impossible. The disease is most common in patients of menopausal or post menopausal age. It sometimes develops in patients who have received an artificial menopause by radiological measures and in young patients when both ovaries have been removed by operation. It is, however, sometimes seen in young patients who menstruate regularly.

Histologically, it is possible to recognise two stages in the development of the disease. In the first stage, which is one of hypertrophy and hyperplasia, there is well marked œdema of the stratum papillare, so that the layer may be increased to four or five times the normal thickness. Simultaneously some degree of hyperkeratosis can be demonstrated. Even at this early stage there is loss of pigment of the melanoblasts and melanophores which leads to the characteristic white colour of the affected areas.

The second stage is one of atrophy, in which the three layers of the epidermis are involved, together with a disappearance of the papillæ of the Malpighian layer. The œdema of the previous stage is replaced by deposition of hyaline material in the cutis vera. The elastic fibres of the cutis gradually disappear while

at the same time a perivascular plasma cell infiltration can be demonstrated in the cutis. The sweat glands, sebaceous glands and hair follicles also disappear.

The aetiology of the disease is unknown. During the postmenopausal atrophy of the vulva somewhat similar changes develop to a minor degree, for the skin atrophies, and it is not uncommon for tender red areas to be formed around the urethral meatus and in the region of the vestibule. The results of the treatment of kraurosis vulvæ with the ovarian hormones are not always satisfactory.

It is now believed that carcinoma of the vulva may arise in areas affected by kraurosis, and Gårdlund states that 14 per cent of cases are complicated by the development of carcinoma of the vulva.

Symptoms Kraurosis vulvæ causes severe local soreness and tenderness. Pruritus is well marked, and quite often dysuria develops if the urethral meatus is involved. One of the most prominent symptoms is dyspareunia, and in the late stages of the disease coitus is impossible.

Treatment The treatment of kraurosis vulvæ is unsatisfactory. In the early stages treatment should follow the lines indicated in the section dealing with pruritus vulvæ, but there is usually no response to X rays treatment. Nowadays large doses of oestrin are used in the treatment of the disease. No response is to be expected from small doses. Preferably, stilboestrol should be given by mouth in doses of the order of 5 mgm three times a day. If a patient can take larger doses without the development of vomiting and headache, the dose should be increased, otherwise stilboestrol should be administered subcutaneously. In severe cases and in cases in which the development of a carcinoma is suspected, the vulva should be excised.

Ulceration of the Vulva

The forms of ulceration of the vulva are diverse, although ulceration of the vulva is not seen very frequently.

Venereal Ulcerations

Ulcus Molle, or soft sore, is usually found in the region of the posterior commissure, although any part of the vulva may be affected, and quite frequently multiple ulcers are present. The

ulcer is rounded or oval in shape with reddened undermined edges and purulent discharge. The specific Durey bacillus can be demonstrated in smears taken from the exudation from the ulcer after staining with methylene blue. The *ulcus molle* is essentially a local infection with a tendency to auto inoculation in the immediate vicinity. Inflammation of the inguinal glands is a common complication. The disease rarely lasts for more than six weeks and should be treated by the application of iodoform powder.

Primary sore, or hard chancre. In women, primary sores are usually found on the inner surfaces of the *labia minora* although they are also seen near the urethral meatus, in the clitoris region and on the posterior commissure. The sore measures about $\frac{1}{2}$ in in diameter, and is usually ulcerated. It has a typically indurated periphery and is surrounded by well marked cedema which extends widely to involve the *labium majus* and the adjacent tissues. The inguinal glands are always enlarged. The *spirochæta pallida* can be demonstrated in the exudation of the sore.

Secondary Syphilitic Ulcerations. In secondary syphilis multiple small papillomata or condylomata may form on the vulva and around the anus. The condylomata show no tendency to be pedunculated, but are flattened. They are usually associated with small flat ulcers from which the *spirochæta pallida* can be collected for microscopical examination. Tertiary syphilitic lesions of the vulva are extremely rare. They take the form either of gummata or tertiary ulcerations.

Other Forms of Ulcerations of the Vulva

Herpes Genitalis. In herpes genitalis, small vesicles develop on the inner surfaces of the *labia minora* and in the clitoris region. The vesicles have an inflamed periphery and are extremely tender. After rupture they give rise to small ulcerations which clear up with the application of antiseptic powders.

Traumatic Ulcerations. The best example of this type of ulceration is the puerperal ulcer resulting from infected tears of the perineum. Such ulcerations may persist for a long time. They are treated by irrigation with antiseptic solutions and by the application of astringent lotions. Other lacerations may lead to similar forms of ulceration if they become infected.

Follicular ulceration or *ulcus vulvæ acutum* is a rare type of ulceration of uncertain origin. Usually the disease starts by the formation of multiple small follicular abscesses which break down to produce extremely tender ulcerations. Very rarely small gangrenous areas are produced. The condition clears up rapidly after the application of antiseptic dressings.

Tuberculosis of the Vulva. Two types are recognised, the ulcerative and the hypertrophic. Both forms are extremely rare. The ulcerative type is the more common of the two and gives rise to chronic ulceration with well marked peripheral induration. In the hypertrophic form, indurated swellings develop in the vulval region. In both types the diagnosis is made by biopsy, although it should be remembered that tuberculosis of the vulva only develops in patients with advanced tuberculosis elsewhere in the body. Treatment consists in wide excision.

Actinomycosis of the vulva is very rare. It gives rise to an indurated swelling which ulcerates and discharges the characteristic yellow granules. The streptothrix can be demonstrated in the discharge. Treatment consists in local excision together with the administration of large doses of potassium iodide.

Esthiomene or *ulcus vulvæ chronicum* is a rare disease of the vulva associated with hypertrophy and ulceration. The disease is seldom seen at the present day and is restricted to prostitutes. In the early stages of the disease indurated swellings form on the inner surfaces of the labia minora and around the external meatus. They run a chronic course and are resistant to treatment. The indurations may extend and involve the whole of the vulva, and in some cases they spread deeply into the recto-vaginal and vesico vaginal septa. Ulceration is common and large excavations may be produced which involve almost the whole of the vulval region. Strictures and fistulæ of the rectum may be caused by ulcerations of this kind.

The ætiology of the disease is unknown, although it is well established that a small proportion of the patients suffer from syphilis, while in others the hypertrophic form of tuberculosis of the vulva is associated with the disease. In most cases the disease is coincident with chronic gonorrhœa, particularly chronic gonorrhœa of the rectum. The induration is produced by lymphatic stasis and is comparable to that seen in elephantiasis.

The diagnosis is made by excluding syphilis, tuberculosis and carcinoma of the vulva

Treatment is unsatisfactory. In most cases the condition of the patient is poor and first efforts must be directed towards improving the general health with arsenic, iron and vitamins. In cases associated with syphilis, anti syphilitic treatment should be started at once. The local treatment consists in the use of baths and irrigations and the application of antiseptic and astringent lotions. In some cases it is possible to excise the indurated areas, in other cases they can be treated with diathermy or cauterisation. Operations for repair of fistulae are unsatisfactory owing to the unhealthy state of the surrounding tissues.

Elephantiasis of the Vulva

Elephantiasis of the vulva is a rare disease in this country although cases are recorded from time to time. The disease most frequently involves the clitoris, but it may affect the labia minora, and in rare cases the labia majora. The tumour is usually papillomatous in type with large indurated warty excrescences. In other cases there is a symmetrical hypertrophy. Very large tumours of this kind can be seen in most of the pathological museums of this country. On section the tumour has a waxy appearance, while microscopically there is extreme hyperplasia of the papillae of the skin, together with thickening of the cutis. The disease is caused by lymphatic stasis which, in rare cases is congenital, but usually results from such chronic inflammations as syphilis, tuberculosis and esthomenia. The most frequent cause of the disease is tropical infection with filaria. The disease usually runs a chronic course and there is no difficulty in diagnosis. Treatment consists in excision of the excrescences.

Cysts of the Vulva

Apart from Bartholin's cysts, cysts of the vulva are seen infrequently. Nevertheless a large number of different types of vulval cysts have been described.

Bartholin's cyst has already been mentioned in the section dealing with gonorrhoea. Bartholin's cyst is caused by occlusion of the duct of the gland by fibrous tissue as the result of Bartholinitis. The cyst should be regarded as a retention cyst of the duct of Bartholin's gland. It lies in the substance of the labium



FIG 60 Bartholin's cyst.



FIG 61 Bartholin's cyst. The cavity of the cyst lies to the left and is lined by transitional epithelium. Below and to the right lies Bartholin's gland.

majus and the labium minus passes over the convexity of the swelling. Bartholin's cysts are oval in shape and may become as large as $2\frac{1}{2}$ in in length. They are usually adherent to the skin of the inner surface of the labium minus and are fixed posteriorly in the situation of Bartholin's gland, while

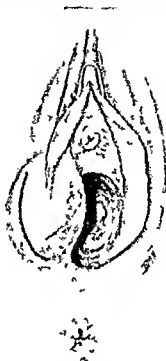


FIG. 68. Bartholin's cyst. Notice that the labium minus passes over the convexity of the cyst. The black line indicates the site of the incision which is made to excise the cyst.

anteriorly they are more movable beneath the skin. The cysts are treated by excision under a general anaesthesia.

Rare cystic swellings of the labium majus are cystadenomata, arising from sweat glands, cystadenomata of Bartholin's glands, and cystic swellings containing blood comparable to chocolate cysts of the ovary which represent forms of heterotopic endometrial proliferations. Cysts of the labium majus have been described which are lined by ciliated epithelium. The cysts may be simple in type when they are regarded as arising from embryological rests of the urogenital sinus. A few cases of

papillomatous cysts have been described which are microscopically identical with the cystadenoma serosum papillare of the ovary

Sebaceous cysts and lymphatic cysts of the labium minus are seen from time to time. They offer no difficulty in diagnosis and are treated by excision.

Small cysts of the hymen have been described. They are most common in the new born and are considered to arise from relics of Gartner's duct.

Cysts of the paraurethral region form rare swellings and arise from the paraurethral glands.

Cysts of the vulva must be distinguished from cysts of the canal of Nuck, from labial herniæ and from adenomyomata of the round ligaments. The diagnosis should be made without difficulty, for such swellings are found in the substance of the labium majus, lateral to the cysts of the vulva which have just been described.

NEOPLASMS OF THE VULVA

Endometrioma. Endometriomata of the vulva are rare tumours, and only a small number of cases have been recorded. They have been found on the mons veneris, on the perineum, and on the labia majora. The tumours enlarge and become painful during menstruation. They are composed of tissue resembling the endometrium of the uterus and cyclical changes have been demonstrated in them during the menstrual cycle. The recorded tumours have been plum coloured, and the characteristic menstrual tenderness enables the diagnosis to be established. The tumours are treated by excision.

Endometriomata of the vulva are difficult to explain on the theory of implantation for they are subepithelial (see Chap XXIII, p 537). In some cases endometriomata have been found in the pelvis in association with the tumours of the vulva, and the theory of lymphatic permeation has been used to explain the development of endometriomata of the vulva. They are, however, much more conveniently explained by supposing that they represent reaction of remnants of the Müllerian system to the stimulus which is responsible for pelvic endometriosis.

Endometrioma of the vulva must be distinguished from the more common tumours of the round ligament and of the inguinal canal. Endometriomata of hernial sacs are relatively common, but endometrioma of the vulva is rare.

Papillomata of the Vulva Two forms of papillomata of the vulva are recognised condylomata accuminata and simple papillomata

Condylomata accuminata are small warty growths plentifully distributed over the vulva. In early cases the warts develop on the labia majora and labia minora as isolated flat papillomata covered with thickened epidermis. Later in the disease, the papillomata fuse and spread to involve the whole of the vulva the perineum, and even the anal region.

Condylomata accuminata have no relation to syphilis although 75 per cent of cases are found amongst prostitutes. In most cases there is evidence of chronic gonorrhœa, but there is no reason to believe that all cases are caused in this way. There is experimental evidence that the condylomata may spread by contact but the ætiology of the disease is unknown.

Treatment consists either in local excision, or, in advanced cases, in the application of such cauterising solutions as chromic acid, formalin and carbolic acid. Good results have been reported after the application of radium plaques and also after the use of X rays.

Simple Papilloma Simple papillomata of the vulva are infrequent tumours, which usually arise on the mons veneris or the labium majus. The tumours are pedunculated and have a characteristic cauliflower like appearance. They are covered by squamous epithelium but the core consists of connective tissues and there is no induration at the base. Transition into malignant tumours is a very rare complication. Treatment consists in excision.

Connective Tissue Tumours of the Vulva

Fibroma Fibromata of the vulva are infrequent tumours which arise during the child bearing period of life, and because of the vascularity of the vulval region they may attain a large size. The tumours are encapsulated and take the form of spherical or ovoid swellings. The consistence is hard although softening develops after cystic degeneration. The surface of the tumour may become irregular if the tumour assumes a papillomatous form. Very large tumours of this kind, weighing as much as 15 lbs have been described. The tumours usually arise from the labia majora, but a few cases are on record in which the tumour developed from the labium minus, the clitoris region,

and the hymen. Similar tumours have been described arising from the fascia of the pelvic diaphragm and from the tissues of the vesico vaginal and recto vaginal septa. The tumours give rise to no symptoms except the discomfort of a large swelling in this region. The diagnosis is usually made without difficulty and treatment consists in excision. The tumour should be examined carefully histologically to ensure that it is not a fibrosarcoma.

Fibromyoma. Fibromyoma of the vulva is a rare tumour which possesses characters similar to those of a fibroma. The tumours grow slowly and give rise to no symptoms. They must be distinguished from myomata of the inguinal canal. They are treated by excision.

Lipoma. Lipoma of the vulva is a rare tumour which usually arises in the tissues of the mons veneris or of the labium majus. Large tumours may be formed and cases have been recorded in which the tumour obstructed delivery. The tumours may spread deeply along the vesico vaginal septum and into the para vaginal tissues. The tumours are easily recognised by their characteristic consistence and are treated by excision.

Neuromata, chondromata and hæmangiomas of the vulva are rare tumours.

Sarcoma of the Vulva. Primary sarcoma of the vulva is a very rare tumour. The tumour usually arises in the labium majus or in the clitoris and only rarely in the labium minus. A rare form of sarcoma of the urethral meatus has also been described.

Sarcoma of the vulva may give rise to either a diffuse swelling or a localised pedunculated tumour. Large tumours have been recorded which have broken down and ulcerated. The tumours infiltrate the surrounding structures and permeate into the inguinal glands. Generalised metastases subsequently develop. Most tumours are spindle celled and care must be taken in the differentiated diagnosis between fibroma and sarcoma of the vulva. The tumours may arise at any age, the average age of onset is 40, which is younger than in the case of malignant melanoma.

The tumour gives rise to no symptoms beyond swelling, irritation and pain. The tumour is treated by wide excision followed by the use of deep X rays therapy to the scar and the inguinal glands. One of the characteristics of the tumour is that recurrences frequently develop in the scar. The prognosis

in cases of sarcoma of the vulva is bad because of the spread of the growth by way of the blood stream

Grape-like Sarcoma The grape-like sarcoma of the vagina which develops in young children may protrude at the vulva or may infiltrate the surrounding tissues to give rise to a tumour

which appears to originate from the tissues around the vaginal orifice These tumours will be described under the heading of grape like sarcoma of the cervix They are mixed tumours comparable to the Wilms' tumour of the kidney and contain striated muscle fibres

Malignant Melanoma
Malignant melanoma of the vulva is seen from time to time when it arises either from the clitoris, the labium majus or the labium minus The tumour usually arises between the ages of 50 and 60, and the average age of onset is 54, although a few cases have been recorded in patients under the age of 30 The tumour gives rise to a dark blue or dark brown swelling which is usually soft with a smooth shining surface The tumour rapidly ulcerates when it causes irritation and discharge



FIG 69 Carcinoma of the vulva

Pigment cells are represented in the normal skin of the vulva by the chromatoblasts of the basal layer of the epidermis and by the chromatophores of the papillary layer of the corium The majority of malignant melanomata of the vulva arise from the chromatophore cells

The tumour gives rise to few symptoms until it ulcerates, when a bloodstained purulent discharge is complained of The prognosis in cases of malignant melanoma of the vulva is bad

and the average duration of life from the onset of symptoms is about eighteen months. The tumour spreads both by way of the blood stream, when it gives rise to generalised metastases, and also by lymphatic permeation, when it infiltrates the inguinal lymphatic glands and spreads upwards to the iliac and lumbar glands. Large swellings are sometimes produced in the inguinal glands which suggest that the primary tumour should be regarded rather as a carcinoma than as a sarcoma. Treatment consists in wide excision of the primary growth together with the regional lymphatic glands, followed by the use of deep X rays therapy.

Carcinoma of the Vulva Carcinoma of the vulva is a relatively rare form of carcinoma of the female genital tract. The incidence of carcinoma of the female genital tract is as follows —

Fallopian tube	0.3 per cent
Vagina	2.8 "
Vulva	3.2 "
Ovaries	7.5 "
Body of uterus	15.0 "
Cervix of uterus	71.2 "

The tumour usually arises in patients between the ages of 60 and 70, but it is sometimes seen in young women between the ages of 20 and 25. Three clinical types of tumour are recognised, the cauliflower growth, the flat induration, and the excavated ulcer. The tumour arises most frequently in the labia majora (in 43 per cent of cases), and is seen less frequently in the labia minora (20 per cent), the clitoris (20 per cent), and rarely in the perineum. Carcinoma of the urethral meatus and adenocarcinoma of Bartholin's gland are rare tumours.

The typical tumour is a squamous celled growth with well marked tendency to the formation of epithelial pearls. It differs from carcinoma of the cervix in that it is composed only exceptionally of actively dividing immature cells. Frequently, calcium salts are plentifully deposited in the tumour.

The relation of carcinoma of the vulva to leucoplakia and kraurosis is disputed. It is well established that carcinoma of the vulva may arise coincidently with leucoplakia and recent work has demonstrated that carcinoma of the vulva may also arise in cases of kraurosis vulvæ. There are, however, no

grounds for believing that leucoplakia vulvæ is always present prior to the development of carcinoma of the vulva

The growth infiltrates the tissues of the vulva and produces a bony hard induration which may extend upwards towards the mons veneris laterally towards the inguinal region and deeply to involve the paravaginal tissues. Involvement of the urethra is of great importance for it leads to infection of the urinary tract, and as a result of ascending infection to the kidneys gives rise to pyelonephritis and causes the death of the patient from



FIG. 70. Carcinoma of the vulva showing epithelial pearls

uræmia. In other cases the growth extends backwards to involve the rectum. Carcinoma of the vulva may also perhaps spread by contact and it is not uncommon for a carcinoma to develop in the opposite labium without direct continuity being found between the primary growth and the opposite side.

The carcinoma cells permeate to the horizontal group of the inguinal glands where fixed indurated swellings are formed. From these glands the carcinoma cells spread upwards to the iliac and obturator glands. In advanced cases the primary growth ulcerates and becomes infected the inguinal glands suppurate and the chronic sepsis thereby induced eventually leads to the death of the patient. In some cases the carcinoma

spreads by way of the blood stream, so that generalised metastases are produced

The prognosis in cases of carcinoma of the vulva is indefinite. The average duration of life from development of symptoms is of the order of sixteen months, but cases are seen from time to time in which the primary growth is slow growing, comparable in type to the scirrhus carcinoma of the breast.

The first symptom complained of by patients with carcinoma of the vulva is the development of a nodule at the vulva. This is followed by pruritus which is always well marked in cases of carcinoma of the clitoris. Later, discharge, bleeding and pain develop. Pain is usually severe, and extreme tenderness may be present in cases of carcinoma of the clitoris. The diagnosis of carcinoma of the vulva is usually made without difficulty, for the growth is always indurated and fixed and when ulcerated has a characteristic appearance.

The treatment of carcinoma of the vulva consists in excision of the primary growth together with the affected inguinal glands and the intervening cellular tissues which contain infiltrated lymphatics. In advanced cases it is necessary to excise the whole of the vulva together with the inguinal glands of both sides, and for this purpose similar principles are followed as during the removal of the breast for carcinoma. In early cases of carcinoma of the vulva in which the growth is restricted to one side, it is necessary only to remove the affected half of the vulva together with the inguinal glands of that side. Care must always be taken to avoid injuring the urethra.

In recent years carcinoma of the vulva has been treated by the use of radium needles and good results have been reported when small doses of radium have been used for a long period of time and when X rays have been employed in the treatment of the affected inguinal glands. When the primary growth is small the growth may be removed by local excision and the inguinal glands treated with X rays.

Secondary Growths of the Vulva

Secondary growths are sometimes seen at the vulva. In cases of chorion epithelioma, metastases are not unusual in the lower third of the vagina which spread to involve the vulval region. Similarly, in cases of carcinoma of the cervix, the growth sometimes spreads beneath the anterior vaginal wall to

ulcerate in the region of the vestibule Metastases in the lower third of the vagina and at the vulva are sometimes seen in cases of carcinoma of the ovaries The grape like sarcoma of the vagina which arises in young children may also extend to the vulval region

CHAPTER VIII

DISEASES OF THE VAGINA

BIOLOGY OF THE VAGINA

THE vaginal secretion is partly derived from mucus secreted by the cervix, partly from the desquamated epithelium of the vagina and partly from a transudation through the vaginal walls. The vagina itself contains no glands. In healthy virgins the vaginal contents consist of white coagulated material which, when examined histologically, is found to be composed of squamous cells and Döderlein's bacilli, together with coagulated secretion. Döderlein's bacilli are large Gram positive bacilli, but it is not uncommon for smaller forms of the same organism to be found. Döderlein's bacilli are sugar fermenting, and as a result the healthy vaginal secretion is acid from the presence of lactic acid.

The secretion from the uterus consists in the main of the mucous secretion of the glands and epithelium of the cervical canal, but during the secretory phase of the menstrual cycle and in those cases of myomata in which the cavity of the uterus is enlarged, secretion is also discharged from the glands of the body. In healthy virgins the secretion from the cervix is small in amount, and relatively little cervical secretion can be demonstrated in the healthy vagina. The old view that the vaginal contents were mainly derived from the mucus of the cervical canal has been shown to be erroneous. In recent years attention has been focussed on transudation from the vaginal walls as the source of the vaginal secretion. The vaginal epithelium and the squamous epithelium of the portio vaginalis of the cervix stain deeply with iodine, because the cells contain a substance allied to glycogen. Desquamation of the superficial horny cells of the vagina probably takes place continuously, the glycogen like substance being liberated from the cells to be fermented by Döderlein's bacilli with the consequent production of lactic acid.

The oestrous changes in the vagina of such animals as the

guinea pig, rat and mouse, are not paralleled in the human subject, but cyclical variations in the characters of the vaginal epithelium during the menstrual cycle have been postulated by Adler and others, although these variations are not universally accepted

The lactic acid content of the normal vaginal secretion is about 0.8 per cent, it is increased during pregnancy, during the premenstrual phase of the menstrual cycle and during menstruation itself. At the time of the menopause the lactic acid content falls, with the result that foreign organisms invade the vagina and in some cases cause vaginitis

Flora of the Female Genital Tract

In healthy women the Fallopian tubes, the cavity of the uterus and the upper third of the cervical canal are free of micro-organisms. The lower third of the cervical canal always contains micro-organisms as does the vagina. In healthy women Döderlein's bacillus is the only organism found in the upper two thirds of the vagina, but in the neighbourhood of the vulva both saprophytic and parasitic organisms can usually be demonstrated. Döderlein's bacilli have been found in the vagina of the new born within nine hours after delivery, although the usual time for them to appear is fifteen hours. The vagina of the new born is probably inoculated during parturition.

During the puerperium the acidity of the vagina is reduced and foreign organisms such as coliform bacilli and the bacillus proteus, together with small Gram positive bacilli, are often found.

During the climacteric and after the menopause the number of Döderlein's bacilli is reduced and sometimes the organism cannot be demonstrated in the vagina.

The importance of Döderlein's bacillus is that it is responsible for the production of the lactic acid contained in the vagina, and this acidity inhibits the growth of other organisms. Infections of the vagina are therefore prevented. In multiparous women when the vaginal orifice is patulous as the result of lacerations during child birth, foreign organisms may be found in the lower part of the vagina, and by producing a lower grade vaginitis may give rise to discharge. In cases of leucorrhœa the acidity of the vagina is reduced, foreign organisms are found, and it is possible to grade film preparations of the vaginal

contents into groups which indicate with a fair amount of precision the degree to which the vaginal secretion departs from the normal

Grade 1 Döderlein's bacilli and squamous cells alone, the condition found in healthy women

Grade 2 Döderlein's bacilli, squamous cells, the comma variable, a few leucocytes Vaginal secretion of this kind is present in healthy women, particularly in multiparæ in whom the vaginal orifice is relaxed

Grade 3 Only a few Döderlein's bacilli and squamous cells, but many comma variable organisms, Gram positive and Gram negative cocci and many leucocytes This condition is present in multiparæ with extensive perineal lacerations, in cases of inflammations of the cervix and in cases of ulcerating new growths of the genital tract

Grade 4 No Döderlein's bacilli, only a few squamous cells, but many leucocytes, streptococci, sarcinæ and trichomonada vaginalis Vaginal discharges of this kind are met with typically in severe cases of leucorrhœa

Leucorrhœa Fluor Genitalis

The term leucorrhœa, or fluor genitalis, should be restricted to cases in which the normal vaginal secretion is increased in amount Purulent discharges due to infections such as gonorrhœa, to ulcerated growths of the cervix and vagina and to discharges caused by urinary fistulæ, are of a different type There is, however, much confusion in the use of the word leucorrhœa, and some authorities use the term to describe any white or yellowish white discharge from the vagina

An increase in the normal vaginal secretion develops physiologically at puberty, during pregnancy, and, in some women, during the premenstrual phase of the menstrual cycle During pregnancy the normal discharges are increased in amount because of the vascularity of the female genital tract During the latter part of the menstrual cycle the hypertrophied premenstrual glands of the endometrium of the body secrete mucus which is discharged from the cervix into the vagina The leucorrhœa of puberty is probably caused by the increased vascularity of the uterus and vagina at that time

Vaginal discharges of a leucorrhœal type can be classified according to the source of the discharge

Fluor Cervicæ Cervical discharges arise in such conditions

as acute and chronic cervicitis, in cases of adenomatous erosion, mucous polyp, and in the condition ectropion when the cervix has been badly lacerated during child birth and columnar epithelium covers the everted lips of the cervix. Discharges of a somewhat similar type are met with in cases of myomata of the uterus in which the cavity of the uterus is enlarged.

Cervical discharges are distinguished by being mucoid in type, and, characteristically, the patients complain of a mucous discharge at the vulva. When the mucous secretion of the cervix is produced in excess it undergoes little change in the vagina. The amount of mucus normally secreted by the cervix is probably small. Probably the small quantity of cervical secretion which is normally discharged into the vagina is broken down so that the carbohydrate radical of the glycoprotein mucin is split off and fermented into lactic acid. It seems, however, that the number of Döderlein's bacilli found in the vagina is only capable of dealing with the small amount of mucus normally secreted by the cervix. If mucus is discharged from the cervix in excess, it causes a mucous discharge at the vulva.

Fluor Vaginalis. The most important forms of leucorrhœa are found in those cases in which the discharge originates in the vagina itself as a transudation through the vaginal walls. These cases are extremely common and the pathology is not fully understood. It is now established that almost all the lactic acid of the healthy vagina is formed from the glycogen contained in the horny cells of the vagina and the vaginal portion of the cervix. The cells are constantly being desquamated when their glycogen is liberated to be fermented by Döderlein's bacilli a process which results in the production of lactic acid. It is also established that a large number of cases of fluor vaginalis or true leucorrhœa are not caused by infection of the vagina. Some of the worst cases of leucorrhœa arise in virgins in whom no local abnormality can be detected. Leucorrhœa of this type often gives rise to a profuse discharge which necessitates the wearing of a diaper and causes pruritus and inflammation at the vulva.

There is reason to believe that many cases of leucorrhœa are caused by disturbances of nutrition which reduce the glycogen content of the vaginal epithelium. It is well known clinically that this type of leucorrhœa frequently arises in chlorosis and in chronic medical diseases such as rheumatoid arthritis and malignant disease. There is some evidence that a leucorrhœa

may be caused by ovarian insufficiency, for leucorrhœa is not uncommon in cases of amenorrhœa and hypomenorrhœa, and the production of an artificial menopause by radiological means frequently leads to a profuse leucorrhœal discharge. The leucorrhœal discharge in cases of fluor vaginalis certainly does not emanate from the cervix and should be regarded as a transudation through the vaginal walls. In such cases the vaginal walls are either diffusely reddened or stippled with red patches partly due to desquamation of the horny cells of the vagina and partly to a low grade vaginitis caused by invasion of the vagina with micro organisms which spread upwards from the vulva. The reduction in the lactic acid content of the vagina in cases of leucorrhœa allows such organisms to multiply.

In leucorrhœa of this kind two factors can be distinguished, the first is the reduction in the lactic acid content of the vagina caused by defects of the horny cells of the vagina, the second an increase in the transudation through the vaginal walls. The cause of this increased transudation is not clear. It is probably determined partly by defects of the horny cells and partly by a low grade vaginitis induced by the presence of extraneous organisms.

In some cases of profuse leucorrhœa the trichomona vaginalis can be demonstrated in hanging drop preparations of the vaginal secretion. These cases will be described in a later section, but it seems probable that the trichomona is itself not the cause of the leucorrhœal discharge but is rather of the nature of a parasitic infection.

Purulent discharges are produced by such infections of the vagina as the gonococcal vaginitis of children, the vaginitis due to foreign bodies such as retained pessaries and by the specific forms of vaginitis such as vaginitis senilis and vaginitis cystica, which will be referred to later.

Cases of vaginal discharge and leucorrhœa probably cause practitioners more trouble in diagnosis than any other minor gynecological ailments. Leucorrhœa must be distinguished from gonorrhœa and care must be taken to differentiate between the cervical discharges of chronic cervicitis and the vaginal discharge of fluor vaginalis. It is useless to treat the cervix for chronic cervicitis if the discharge is caused by an increased transudation from the vaginal walls. Care must therefore be taken to discover the source of the discharge, and for this purpose it may be necessary to examine the patient in the

lithotomy position, and in some cases even under anaesthesia. The error commonly made is to attribute the discharge to erosion of the cervix when it is caused by an increased transudation through the vaginal walls. In *fluor vaginalis* it is common to find a coincident erosion of the cervix, but the discharge should not be attributed to chronic cervicitis unless mucus or muco purulent discharge can be seen coming through the external os. Cases of gonorrhœa should be recognised and investigated by the methods described in Chapter VI.

Vaginitis

Vaginitis is best illustrated by the acute gonococcal vaginitis of children. Acute gonorrhœa causes vaginitis in adults only when the infection is virulent. Other acute infections causing vaginitis are diphtheria and acute specific fevers such as measles and scarlet fever, but cases of this kind are rare at the present day. Vaginitis due to foreign bodies such as pessaries is not uncommon. Simple ring pessaries used in cases of prolapse produce discharge by damaging the vaginal epithelium. Old retained pessaries may lacerate the vagina, particularly in the region of the posterior fornix and cause ulceration and offensive purulent discharge. Similar forms of vaginitis are produced by occlusive pessaries and by foreign bodies.

Vaginitis is not infrequently caused by douching with strong antiseptic solutions. Strong solutions of lysol often produce a well marked vaginitis when used in the treatment of leucorrhœa. Other antiseptic solutions such as perchloride of mercury, carbolic acid, silver nitrate, and tincture of iodine often produce severe vaginitis when used as douche solutions in cases of *fluor vaginalis*.

Secondary vaginitis may be caused by the discharge of pus from the uterus in cases of cervicitis, carcinoma of the cervix, pyometra and by the discharges from urinary fistulæ. In prolapse the vaginal walls often become inflamed so that the epithelium becomes thickened, and in some cases trophic ulceration is produced. A mild degree of vaginitis is often seen in cases of complete tear of the perineum and when the vaginal orifice is patulous as a result of old tears of the perineum.

Vaginitis Granulosa. Granular vaginitis is restricted to the upper third of the vagina and is best marked on the posterior vaginal wall. The vaginal walls feel granular and small nodules

can be seen if the vagina is examined with a speculum. Granular vaginitis becomes aggravated during pregnancy when it leads to a profuse vaginal discharge, and affected patients often develop a mild degree of puerperal endometritis. The disease is not gonococcal in nature and its pathology is unknown. When examined histologically the vaginal walls are found to be infiltrated with leucocytes in the region of the nodules and the capillaries are dilated. During pregnancy the profuse vaginal discharge sometimes causes condylomata at the vulva. The disease usually arises in young women and is restricted to the child bearing period of life. It is seen fairly frequently.

Vaginitis Senilis The atrophic changes which develop in the vagina during and after the menopause reduce the resistance of the vaginal epithelium to infection, and as a result a mild degree of vaginitis is not uncommon in women of post menopausal age. In typical cases the vaginal walls are stippled with small red areas which are distributed over the vaginal portion of the cervix as well as over the vaginal walls. In severe cases the red areas bleed easily on touch, and such patients often complain of a bloodstained yellow vaginal discharge. The red areas are comparable to those which develop in post menopausal women around the vaginal orifice and around the urethra. As the result of the deposition of fibrous tissue in the process of healing, scarring of the vaginal walls is not uncommon. The fibrous bands, found deep to the vaginal epithelium in old women, are probably caused in this way. Cases of vaginitis senilis are of importance because of the symptom post menopausal hæmorrhage. Such cases must be investigated carefully to exclude the presence of carcinoma of the female genital tract. The two conditions are frequently coincident.

Trichomona Vaginitis In vaginitis of this type the vaginal discharge is thin, yellowish in colour, and often frothy. The vaginal walls are extremely tender and the discharge causes pruritus and inflammation at the vulva. The condition should be suspected if the vaginal discharge is thin and frothy, and if these symptoms are present. The trichomonada can be demonstrated in hanging drop preparations of the vaginal discharge, they cannot be distinguished in film preparations. The trichomona is slightly larger than a leucocyte and is actively motile. It is unknown whether the trichomona is the primary cause of vaginitis of this kind or whether it should be regarded as a secondary infection emanating from the rectum.

Vaginitis Cystica. This rare type of vaginitis takes the form of bullæ in the posterior vaginal wall; the pathology is unknown. The bullæ consist of collections of œdematous fluid in the layers of the vaginal epithelium.

A somewhat similar form of vaginitis is seen during pregnancy when, as the result of infection of the vaginal walls with gas-producing organisms, small vesicles are formed which contain gas.



FIG. 71 *Trichomonas vaginalis*. The specimens are seen only in a wet film and are of varying shapes (3), (4), (5). They may be adherent to a squamous cell (1), or they may be attached to pus cells (2). (Eden and Lockyer.)

Treatment of Leucorrhœa and Vaginitis

In cases of vaginal discharge in which there is some local cause, such as a retained pessary, the cause must be removed. Again, in diphtheritic vaginitis specific treatment must be adopted for the disease, and in vaginitis due to prolapse and secondary vaginitis caused by fistulæ, it is useless to treat the vaginitis without first dealing with the primary cause.

Vaginal Irrigations. The most important part of the treatment of vaginitis consists in the use of vaginal irrigations. Patients and nurses should be given detailed instructions of the correct method of using the irrigations. An enamelled douche can, which can easily be cleaned and sterilised, should be used,

and a long piece of rubber tube should pass from the douche can to the vaginal douche nozzle. The douche nozzle should be made of glass and should be sterilised by boiling before use. Rubber containers for the irrigating solutions should be condemned, for they cannot be cleaned satisfactorily and can only be sterilised efficiently by boiling.

The object of using the douche is twofold. First, it should irrigate away the vaginal discharge and secondly it should bring antiseptics into contact with the vaginal walls. The longer the antiseptic solution remains in contact with the vaginal walls the better. The patient should lie on her back and during the irrigation the douche can should be raised to a level of about 1 ft. above the vagina. The most convenient form of douche nozzle is one which is two way, with both inlet and outlet tubes, pyriform in shape, which can be inserted into the vagina and when pushed firmly into position prevents the irrigating fluid running out of the vagina except through the exit tube. A long tube can be attached to the exit tube and passed to a receptacle under the bed. Another method is for the patient to lie in a warm bath with the douche can placed upon a bath tray, the exit fluid from the vagina passing into the bath water. About twenty minutes should be spent over a vaginal irrigation and by compressing the rubber tube passing from the douche can to the nozzle the patient can ensure a slow flow of the irrigating solution. At least two pints of irrigating fluid should be used, the temperature of which should not be more than 105°F . Hot irrigations may do more harm than good by damaging the vaginal walls. It will be found that most patients fail to understand the purpose of the vaginal irrigations, and believe that rapid vaginal douching is the correct method to employ. In cases of leucorrhœa and vaginitis, vaginal irrigations should be used at least twice every day at the beginning of treatment, and *the frequency should gradually be reduced as the treatment continues*.

Care must be taken in selecting the particular solution to be used for the vaginal irrigation. In cases of gross sepsis, such as is seen in the ulceration of retained pessaries, an alkaline solution containing 60 grains of sodium bicarbonate to the pint should first be used to irrigate away purulent discharges. This alkaline solution is also useful when treating the mucous discharges of adenomatous erosions and the mucopurulent discharges of chronic cervicitis. In cases of gross sepsis a douche of hydrogen

peroxide followed immediately by a saline vaginal irrigation is very useful. For the mild vaginitis caused by pessaries and for cases of senile vaginitis, a solution containing 40 grains of alum and 20 grains of zinc sulphate to a pint is very useful. Other astringent solutions used are copper sulphate 1 per cent, zinc sulphate $1\frac{1}{2}$ per cent. Antiseptic solutions, such as potassium permanganate 1 in 1 000, salicylic acid 2 parts in 1,000 may be employed, but solutions of eusol and dettol should be used with caution, as they may produce irritation of the skin around the vulva. Similarly, solutions of mercury should be avoided because of the danger of poisoning. This danger is very real in pregnancy, with children, and when there is any possibility of the solution passing upwards into the cavity of the uterus, as may easily occur in cases of abortion and during the puerperium. Solutions of lysol are used probably more extensively than any other, mainly because they are cheap and deodorising, but strong lysol solutions often do more harm than good in cases of leucorrhœa of the fluor vaginalis type.

In cases of fluor vaginalis the most satisfactory solution to use is one containing lactic acid, strength $\frac{1}{2}$ per cent. It is customary to use the B.P. Codex preparation strength 60 per cent lactic acid using one teaspoonful of the concentrated solution to each pint of water.

A common mistake made in vaginal irrigations is for the antiseptic to be placed in the douche can first and for the water to be added afterwards. The first part of the irrigating solution then consists of almost pure antiseptic and may burn the vagina and vulva. Cases of this kind are seen remarkably often, particularly when lysol has been used. After the vaginal irrigation has been given, the patient should stand up for a short time, and after all the douche solution has run away from the vagina the vulva should be dried and powdered. Unless this precaution is taken the irrigating solution may cause a dermatitis of the vulva.

Choice of the particular solution to be used for vaginal irrigation depends upon the local condition. In septic cases a preliminary alkaline douche followed by the use of an antiseptic solution is the acknowledged practice. In cases of leucorrhœa of the fluor vaginalis type there is no better method of treatment than to use lactic acid douches. In vaginalis senilis a simple alum and zinc sulphate solution is usually all that is required. In many cases of leucorrhœa harm may be done by using strong

antiseptic solutions, particularly solutions like lysol which are in themselves irritating

The treatment of vaginitis and of leucorrhœa by means of tampons is sometimes of service. Simple and efficient tampons can easily be made by cutting short strips out of rolls of cotton wool and tying string to one end. The small pieces of cotton wool are soaked in the solution to be used, and then inserted into the vagina. Nurses will find that the tampons can best be inserted by retracting back the perineum with a Sims' speculum and then pushing the tampon high up in the vagina. Patients themselves usually have no difficulty in introducing tampons. It is important, however, that the tampon should be pushed as high up in the vagina as possible, for the antiseptic fluid it contains runs down and bathes the whole surface of the vaginal walls. The solution used for vaginal tampons should always contain glycerine as a base on account of its hygroscopic action. It is customary to use solutions containing 20 per cent ichthyol in glycerine, but other substances such as alum, potassium iodide, iodine in the form of tincture, and silver preparations such as protargol, can also be employed.

Another useful method of treating cases of vaginitis is to apply fairly strong antiseptic solutions directly to the vaginal walls. For this purpose a Fergusson's speculum should be introduced into the vagina, and the antiseptic solution poured down the speculum until it covers the vaginal portion of the cervix. About 10 c c of solution are required. The speculum should be kept in this position for two or three minutes, and then slowly withdrawn. In this way the whole of the surface of the vagina is bathed with the solution used. The speculum is finally withdrawn, the vulva swabbed, and the patient told to wear a pad for a few hours afterwards, so that the antiseptic fluid can be absorbed. Solutions such as 5 per cent silver nitrate, liquor præparatus, protargol, 20 per cent, used in this way are of great service in the treatment of leucorrhœa and of vaginitis simplex.

Cases of leucorrhœa in which the trichomona vaginalis can be demonstrated in the discharge are particularly resistant to treatment. Greenhill advises cleansing the vulva and vagina with a solution of green soap and water, followed by the use of a tampon impregnated with a solution of methylene blue, glycerine and water. Bland and Goodall have recommended the use of picric acid either in the form of a medicated pessary

or applied by swabbing. In the last few years much attention has been paid to the treatment of vaginal leucorrhœa, particularly the form associated with trichomonad infections. One method of treatment consists in the introduction into the vagina of arsenical compounds, the best known of which is Devegán. Other preparations which are used are Stovarsol and Carbarsone. A tablet is introduced into the top of the vagina on alternate evenings. The arsenical treatment is useful in some cases, but it is by no means specific for all cases of this kind. At the present day the treatment of these cases by means of arsenical preparations is in disfavour. Pledgets of cotton wool soaked in Lassar's paste are often of great help, but they must be introduced high into the vagina. Patients often object to the inconvenience of douching so that there is a tendency at the present time to employ tampons impregnated with appropriate chemicals. The Spuman styli are convenient to introduce into the vagina and by their foaming action spread the antiseptic over the vaginal walls. Picragol ovules are also useful.

It is most important, however, to use œstrin in the treatment of these cases. There is always a biological basis for the development of the condition, and with refractory cases œstrin should be given, at first orally in doses of about 1 mgm stilbœstrol and the dose should be increased if there is not an immediate response.

In the average case of trichomonad infections routine treatment should consist in the use of vaginal douches, the introduction of picragol ovules, and the administration of œstrin either by mouth or by injection. Few cases fail to respond.

Clinical experience shows that the fluor vaginalis type of leucorrhœa is often particularly resistant to treatment. So long as a woman douches herself regularly with such solutions as lactic acid, the vaginal discharge and the local inflammation of the vulva can be controlled, but relapses occur as soon as the douching is discontinued. The vaginal irrigations should be regarded as forming only a part of the treatment. Recent work suggests that many forms of leucorrhœa are primarily due to a disturbance of nutrition. In cases of this kind attention should therefore be paid to the general health. Open air exercise should be insisted upon. Constipation should be treated, and the most satisfactory of all purges for patients of this kind is aloes. Tonics and mixtures of iron and arsenic should be freely

administered. Severe leucorrhœa is common amongst women with sedentary occupations who have little or no opportunity for outdoor games. Such patients are often benefited by gymnastic exercises and by the use of artificial sunlight.

Ulcerations of the Vagina

Ulcerations of the vagina are rare. The type which is seen most frequently is that caused by a retained pessary, when the ulcer is usually situated high up in the posterior vaginal wall. The base of the ulcer is covered with granulations which discharge offensive pus. Such ulcerations are easily recognised, but it should be remembered that carcinoma of the vagina sometimes develops in ulcers of this kind, and if there is any suspicion of carcinoma, a biopsy should be performed.

Other forms of vaginal ulceration are as follows —

Venereal Ulcerations. Primary syphilitic sores are rare in the vagina, although fairly frequent on the cervix of the uterus. The ulceration has the characteristic appearance of a primary sore, and the *spirochæta pallida* can be found in the serum discharged from the ulcer.

Secondary syphilitic ulceration of the vagina is also rare, but syphilitic plaques are sometimes found.

Tertiary syphilitic ulceration is again uncommon. Gummatous may form in the recto vaginal septum, ulcerate into the vagina, and lead to the formation of a recto vaginal fistula.

Ulcus Molle or soft sore. The *ulcus molle* sometimes develops on the vaginal walls. In its appearance it corresponds to the form found at the vulva.

Tuberculous ulceration of the vagina is extremely rare. The ulcerations are usually multiple, and are found in conjunction with tuberculosis either of the cervix or of the vulva.

Rare forms of ulceration of the vagina are *ulcus rotundum* in which small rounded ulcers, about 1 cm. in diameter, develop in the posterior vaginal wall, and which are believed to be caused by diseases of the blood vessels. Varicose ulcers have also been described. Ulceration of the vagina is sometimes seen in cases of prolapse, although it is usually restricted to the prolapsed cervix. The ulceration in cases of this kind is very characteristic: the surface epithelium is lost, the base is red, but discharges very little pus, and there is little if any induration at the periphery of the ulcer.

Ulceration after Radiological Treatment. Ulceration of the

vagina frequently develops after the radium or X-rays treatment of carcinoma of the cervix. In most cases there is no difficulty in distinguishing between this form of ulceration and direct spread of the carcinoma to the vaginal walls. Ulcers of this kind give rise to a purulent bloodstained vaginal discharge, and during the process of healing the deposition of scar tissue often distorts the vagina. Adhesions between the vaginal walls is a common sequel, and the upper part of the vagina is sometimes completely shut off.

Scars, Stenoses and Atresia of the Vagina

Extensive scarring of the vaginal and paravaginal tissues is not uncommon. There are three common causes, injuries during child birth, the vulvo vaginitis of childhood and the radio therapeutic treatment of malignant disease of the cervix. The application of forceps during labour prior to the full dilatation of the cervix often leads to splitting of the cervix, and the tear may extend along the vaginal walls. Anterior and posterior lacerations of the cervix are almost invariably produced in this way, and as a result fibrous tissue is deposited which gives rise to firm bands deep to the vaginal walls. Lateral tears of the cervix may spread downwards to involve the vaginal walls, and it is not uncommon to see cases in which there is extensive scarring in this situation. Spiral tears of the vagina, which are usually produced at child birth by deliberate rotation of the head with forceps, are also followed by deposition of scar tissue. The vulvo vaginitis of children sometimes leads to extensive scarring so that stenosis of the vagina, and even complete vaginal atresia, may develop. In cases of complete atresia, the infected material may become pent up in the vagina, forming a pyocolpos and eventually an abdominal swelling may be formed. A few cases of this kind have been recorded. In other cases the vaginal atresia gives rise to hæmatocolpos when menstruation begins. Stenosis of the vagina resulting from scar tissue may cause difficulty during coitus and during child birth. Stenosis of this kind should be treated by surgery, for the simpler methods of gradual dilatation are unsatisfactory.

Cysts of the Vagina

Cysts of the vagina are uncommon. They may be found in any part of the vagina, but are most frequent in the anterior

vaginal wall between the urethra and the vagina. The cysts are generally small, but they may be as much as 3 in. in diameter.

The vagina contains no glands, so that none of the cysts can be regarded as simple glandular retention cysts. The majority of vaginal cysts probably arise from relics of Gartner's duct as simple retention cysts. In such cases the epithelium is either cubical or flattened with plain muscle tissue in the cyst wall. The contained fluid is clear and serous.

Gartner's duct can be traced from the lateral side of the uterus downwards and forwards over the lateral vaginal fornix, so that it finally lies between the anterior vaginal wall and the urethra. The most frequent form of vaginal cyst is that found deep to the anterior vaginal wall between the vaginal wall and the urethra. Such cysts protrude at the vulva when the patient strains and must be distinguished from cystoceles. Gartner's duct cysts are only rarely found in the upper part of the lateral walls of the vagina. Cases have been recorded in which the ureter has terminated in a cyst of this kind, and very rarely an accessory ureter may terminate in this way instead of opening into the bladder.

Other forms of vaginal cysts have been ascribed to distention with fluid of relics of the Mullerian duct. Some cases have been explained by postulating failure of one Mullerian duct to canalise to form half of the vagina, the rudiment subsequently becoming cystic.

Small implantation cysts in the lower third of the posterior vaginal wall are not uncommon and result from perineal tears during partition, episiotomy incisions and the Schuchardt incision which is sometimes employed in the operation of vaginal hysterectomy. Such implantation cysts have a thin translucent wall and the contained fluid is usually bloodstained. Cullen, Frankl and others, have suggested that some of the vaginal cysts found in the middle and upper third of the vagina can also be regarded as implantation cysts and result from lacerations of the vagina during child birth. In most cases the origin of vaginal cysts cannot be accounted for with certainty.

Dermoid cysts of the recto vaginal septum are rare tumours. They give rise to discomfort in the perineal region and to protrusion of the posterior vaginal wall.

Vaginal cysts give rise to no symptoms unless they protrude at the vaginal orifice or cause difficulty during coitus. The cyst can usually be removed without difficulty.

Tumours of the Vagina

Connective Tissue Tumours Fibroma and myoma are the only innocent connective tissue tumours of the vagina which have been described, and they are extremely rare. The tumours usually arise in the anterior vaginal wall and are covered by the vaginal squamous epithelium. They are sometimes polypoidal, and may grow to be as large as 3 in. in diameter. They probably arise from the plain muscle and connective tissues of the vaginal wall. Myomata may also extend from the uterus into the vesico-vaginal septum, and myomata arising from the utero-sacral ligaments may spread downwards into the recto-vaginal septum. In most cases the diagnosis of these innocent vaginal tumours is made without difficulty and treatment consists in the removal of the tumour by excision.

Sarcoma of the Vagina *Primary sarcoma* of the vagina of the round celled, spindle celled or mixed celled type arises as a very rare tumour in children. It rapidly ulcerates and causes a bloodstained discharge, and later infiltrates the cervix, the bladder and the rectum. Multiple metastases are infrequent, although the regional lymphatic glands are soon infiltrated. Treatment should consist in the application of radium and the use of deep X rays.

Grape like Sarcoma Grape like sarcoma of the vagina develops in young children as a polypoidal tumour which fills the vagina and projects at the vulva. It rapidly infiltrates the surrounding structures. The tumour, like the grape-like sarcoma of the cervix, consists of undifferentiated mesodermal cells together with striated muscle fibres. Cartilage, bone and fat have not been demonstrated in the grape like sarcomata of the vagina of the children, although these tissues are found in the comparable tumours which arise in the cervix of adults. The diagnosis of grape like sarcoma of the vagina in children is made without difficulty. The prognosis is extremely bad. Treatment should consist in the use of X rays.

Adenomyosis of the Recto-vaginal Septum Adenomyomatous tumours of the upper part of the posterior vaginal wall are seen from time to time, when they give rise to vascular plum-coloured swellings about the size of a cherry. Two types are known, one in which the swelling is circumscribed, the other in which it is diffuse, when it spreads downwards into the recto-vaginal septum and laterally along the utero-sacral ligaments. The tumours

give rise to severe dyspareunia—for they are extremely tender—to pain on defæcation and in some cases to dysmenorrhœa. In the diffuse type which involves the rectum, stricture of the rectum may develop and cause difficulty with defæcation. The condition is diagnosed by the presence of a tender plum coloured swelling beneath the posterior vaginal wall and of induration immediately behind the cervix uteri. Histologically, the swelling consists of plain muscle and fibrous tissue, together with glandular elements similar to those of the endometrium of the uterus which undergo premenstrual hypertrophy and menstrual necrosis. The swellings usually contain small collections of blood which probably result from menstrual necrosis of the glandular tissues.

In the circumscribed form the swellings can be removed by excision. In the diffuse type surgical treatment is unsatisfactory unless the sigmoid and rectum are also removed. At the present day such cases are treated by the use of X rays or radium. The swellings retrogress after an artificial menopause has been induced by means of X rays.

Carcinoma of the Vagina. Carcinoma of the vagina is a rare tumour, and its incidence is only 2·8 per cent. of all genital carcinomata in the female. The tumour usually arises between the ages of 55 and 60, but it sometimes develops in young women between the ages of 20 and 30. The tumour is most often seen in the upper third of the posterior vaginal wall and produces either a cauliflower like growth or an indurated ulcer. In young patients carcinoma of the vagina usually develops in the lower third of the vagina. The tumour gives rise to well marked induration, and the growth spreads, deep to the vaginal wall, either along the recto-vaginal septum or in the vesico vaginal septum. Later, the growth infiltrates into either the rectum or bladder and gives rise to fistula formation. Permeation of the carcinoma into the regional lymphatic glands is rapid, so that very soon the sacral, the hypogastric and the parametric glands are infiltrated with growth. Histologically the tumour is usually a squamous celled carcinoma but a rare form of adenocarcinoma has been described. It is well known that carcinoma of the vagina may develop in the ulceration caused by retained pessaries, and according to Postevin and Petit, leucoplakia of the vagina due to syphilis is a predisposing cause in young people.

Symptoms. Carcinoma of the vagina gives rise to pain and

bleeding following coitus, and later to a bloodstained offensive vaginal discharge. As the result of the spread of the growth, vesico vaginal and recto vaginal fistulae may be formed. Pain in the lower abdomen and in the back develops as the result of involvement of nerve fibres. The prognosis in cases of carcinoma of the vagina is much worse than in cases of carcinoma of the cervix because of the proximity of such structures as the bladder and rectum and because of the plentiful supply of lymphatics in the vagina, so that lymphatic permeation of the growth is rapid.

Treatment of carcinoma of the vagina is difficult because of the proximity of such structures as the rectum and the bladder. Early cases can be treated by performing an extensive Wertheim's operation and removing the whole of the vagina. The uterus and parametrium is dissected clear by the abdominal route, then the raw area in the pelvis is covered with peritoneum and the abdomen closed. The vagina is now dissected away from the rectum and urethra from below, and finally the whole of the vagina, the uterus and its appendages and the parametrium pulled down through the vaginal orifice. In more advanced cases surgical treatment consists in removing the uterus and vagina together with the rectum. Good results have recently been reported in early cases after the use of radium needles followed by the application of deep X rays to the pelvis.

The radium needles are best applied in the substance of Stent's dental composition, which can be moulded quite easily to the shape of the growth (Clifford White).

Secondary Malignant Growths of the Vagina

Secondary malignant growths of the vagina are illustrated by the metastases of chorion epithelioma, carcinoma of the cervix and ovarian carcinoma. In cases of chorion epithelioma metastases are not infrequent in the lower part of the vagina near the vaginal orifice, particularly in the perineal region and above the situation of the vestibule. The tumour forms a dark purple coloured swelling which bleeds easily. The appearance is very characteristic.

In carcinoma of the cervix the growth may spread directly to involve the vagina and form an ulcerating growth or it may spread downwards deep to the vaginal mucous membrane to ulcerate in the lower part of the anterior vaginal wall just above

the level of the vestibule. Metastases due to carcinoma of the ovaries are sometimes found in the vagina, usually in the lateral vaginal walls deep to the vaginal wall. Similar metastases are sometimes found in cases of carcinoma of the body of the uterus, but these are rare.

CHAPTER IX.

INJURIES OF THE FEMALE GENITAL TRACT

Most injuries of the female genital tract arise during child birth. In normal delivery the circular fibres which surround the external os are torn laterally on each side so that an anterior and a posterior lip of the cervix become differentiated. Again, as a result of stretching, the vagina becomes more patulous, and through pressure and laceration, the hymen is subsequently represented by irregular tags of skin, termed the *carunculæ myrtiformes*. A superficial laceration of the perineum of the first degree is not uncommon even in uncomplicated cases.

In abnormal labour and when obstetrical manipulations have been carried out, or more commonly as the result of bad technique injuries of the birth canal are not infrequent. Severe degrees of lacerations of the perineum are perhaps the commonest form of birth injury. Tears of the vagina may be caused by rotation of the head with forceps or may take the form of extensions of tears either of the perineum or cervix. Severe lacerations of the cervix are usually caused by the application of forceps prior to the full dilatation of the os, by extracting the head in cases of breech presentations before the cervix is fully dilated, and by controlling the hæmorrhage in cases of placenta prævia by applying violent traction to the half breech after bipolar podalic version. Vesico vaginal fistula usually results from difficult forceps delivery in cases of disproportion while recto vaginal fistula is the result of a complete tear of the perineum.

The majority of obstetrical injuries are theoretically preventable. Cases of disproportion should be recognised ante nally, and treated either by induction of premature labour or by Cæsarian section. Lacerations of the cervix are almost invariably the result of bad midwifery, and extensive tears of the perineum, although usually avoidable, should be treated by immediate suture.

Coitus Injuries

A slight amount of hæmorrhage from the torn edges of the ruptured hymen is normal after defloration but the hæmorrhage is sometimes very severe, particularly when the tear has spread forwards to the region of the vestibule. Cases have been recorded in which alarming hæmorrhage of this kind has occurred. The hæmorrhage can usually be controlled by the application of gauze pressure or of such styptics as perchloride of iron, but suturing under anæsthesia is sometimes required.

Bruising of the vaginal walls is not uncommon in the early days of married life, and a cystitis may result from bruising of the bladder. Such cases are seen frequently, and it is not uncommon for a pyelitis to be set up as a result of an ascending infection to the pelvis of the kidneys, the so called "honeymoon pyelitis."

Lacerations of the vagina caused by coitus are seen from time to time. Predisposing causes are ill development of the vagina, post menopausal atrophy and such malformations as an imperfect vaginal septum. The laceration usually takes the form of a longitudinal tear of the anterior vaginal wall. Cases have been recorded where, as the result of ill development of the vagina the posterior vaginal wall has been torn through and the peritoneal cavity opened up. Similar injuries may occur in patients upon whom vaginal operations have been previously performed. Severe hæmorrhage follows upon injuries of this kind, and Neugebauer collected together 157 recorded cases with twenty two deaths either from hæmorrhage or from the peritonitis caused by tearing through the posterior vaginal wall. When the injuries are small, treatment consists in plugging the vagina. In more severe cases it is necessary to suture the lacerations under anæsthesia.

Other Forms of Trauma

Injuries to the vulva as the result of direct trauma are not uncommon. Such accidents as falling astride gates and chairs are frequent, and usually produce bruising of the labia majora. In more severe cases large hæmatomata develop in the labia majora, for the effused blood spreads widely in the lax connective tissues. Comparable hæmatomata of the vulva are sometimes caused by rupture of varicose veins of the labia

majora during pregnancy, and the large swelling may obstruct delivery. An important complication of hæmatoma of the vulva is infection when, as the result of septic thrombosis of the veins, a fatal pyæmia may be set up.

Injuries to the vulva due to direct violence usually cause only small hæmatomata which respond well to the customary treatment of rest in bed combined with the application of such lotions as *lotio plumbi*. With large hæmatomata it is sometimes necessary to incise the swelling under strict aseptic precautions and to turn out the clot. Lacerations of the vulva region due to direct violence may be followed by severe hæmorrhage if the laceration involves either the clitoris region or the erectile tissue around the vaginal orifice. More serious injuries are those caused when a woman falls on to a sharp protuberance, the point of which may penetrate through the vaginal walls into the bladder, rectum, or even the peritoneal cavity. Such injuries must be treated by immediate operation, the edges of the lacerations being excised and the injuries repaired.

Injuries of the Perineum

A minor degree of laceration of the perineal body often occurs during child birth irrespective of the skill with which the delivery is performed. Statistics show that some degree of perineal laceration occurs in 11 per cent. of all normal deliveries while the incidence is 85 per cent. if obstetrical operations have been performed. Lacerations are between five and six times more frequent with primiparæ than with multiparæ.

It is customary to grade lacerations of the perineum into three degrees. In the first degree the laceration is restricted to the skin of the fourchette. In the second degree the muscles of the perineal body are torn through, while in the third degree the tear extends backwards through the external sphincter of the anus into the rectum and anal canal. A rare type of tear is the central tear of the perineum when the head penetrates first through the posterior vaginal wall, then through the perineal body and appears through the skin of the perineum. Central tear of the perineum is a rare complication of child birth and usually occurs in cases of *hypoplasia genitalis* when the vaginal orifice is small.

Structure of the Perineal Body It is important to appreciate the structure of the perineal body. The perineal body is roughly

pyramidal in shape, the broad base being represented by the skin of the perineum and the apex by a point about a third of the distance up the posterior vaginal wall, for it is at this point that the bowel turns downwards and backwards to form the anal canal. The posterior vaginal wall limits the perineal body in front while posteriorly the perineal body is defined by the anterior wall of the rectum and anal canal. If the perineal body is dissected from without inwards the following muscle layers can be identified. First is a superficial group of muscles which includes the superficial transverse muscle of the perineum, the sphincter vaginae and the external sphincter of the anus. These muscles are attached to the central point of the perineum. Secondly, deep to this layer of muscles lies the superficial layer of the triangular ligament, which is not well developed in the female, while more deeply lies the deep transverse muscle of the perineum. This muscle can be identified without difficulty in cases of perineal tears, whether recent or old, and during the operation of repair, care should be taken to identify the muscle and to suture the cut edges together. Thirdly, deep to the deep transverse muscle of the perineum lie the levator ani muscles, and fibres from the two pubo rectalis groups decussate between the vagina and the rectum. These decussating fibres lie high up, in part above the level of the apex of the perineal body.

Perineal Lacerations

First degree lacerations, restricted to the skin of the fourchette, have no influence upon the integrity of the pelvic floor, but if the lacerations are not sutured after delivery, the vaginal orifice becomes more patulous. In practice small lacerations of the fourchette are not sutured unless they extend to the skin of the perineum, where they are more likely to become infected and to cause pain during the routine swabbing of the perineum during the puerperium.

Second degree lacerations should always be sutured carefully immediately after delivery, for the pelvic floor is weakened unless the injury to the muscles of the perineal body is efficiently repaired. If the decussating fibres of the levator ani muscles have been torn through, the hiatus urogenitalis becomes patulous because the two levator muscles separate from each other. As a result, prolapse of the vagina and uterus is more likely to develop than when the lacerations have been properly repaired immediately after delivery.

With extensive second degree tears, the patient should be anaesthetised, placed in the lithotomy position, and the torn muscles of the perineum identified and sutured together with catgut. The torn edges of the vagina and the skin of the perineum should then be sutured together with either catgut or silkworm gut sutures. With smaller lacerations all that is necessary is to insert, with a large perineal needle, a few deep sutures which include the cut edges of the torn muscles. The essential part of the after treatment of perineal lacerations consists in keeping the perineum dry. Frequent swabbing is therefore imperative during the puerperium. The wound should be irrigated after micturition and defaecation with an antiseptic solution, such as hydrogen peroxide, and then swabbed with a weak solution of spirit.

Third degree tears are much more important for unless they are efficiently repaired immediately after delivery, the patient becomes incontinent of feces and flatus. Amongst the predisposing causes of complete tear of the perineum are forceps delivery in persistent occipito posterior presentations, and extraction of the after coming head in breech presentations in primiparae. Large heads and precipitate labour are also factors, but unfortunately the commonest cause is vigorous pulling in the wrong direction during forceps delivery, so that no opportunity is given for the head to be born by the natural mechanism of extension.

In complete tear of the perineum, repair should be performed as soon as possible after delivery. A practitioner should not undertake the repair of a complete tear of the perineum single handed. The operation should be undertaken under anaesthesia with the patient lying in the lithotomy position in a good light, and an assistant is necessary. If the tear occurs in the middle of the night, it is legitimate to wait until the next morning before performing the operation, but further delay is unjustifiable owing to the risk of infection of the torn and bruised areas.

The immediate repair of a complete tear of the perineum is a relatively simple procedure, for the muscles of the perineal body though torn, can be distinguished without much difficulty. The surrounding skin is first cleaned with ether and the operation area shut off with sterile towels. A sterile pack is placed in the vagina and the limits of the laceration defined with Lane's tissue forceps. The rectum and the anal canal are first repaired by interrupted catgut sutures, the knots being turned towards the anal

canal. A few Lembert's sutures are then introduced to invaginate the tear in the bowel wall. The muscles of the perineal body are now sutured together, and every effort should be made to obtain exact anatomical reposition. Particular attention

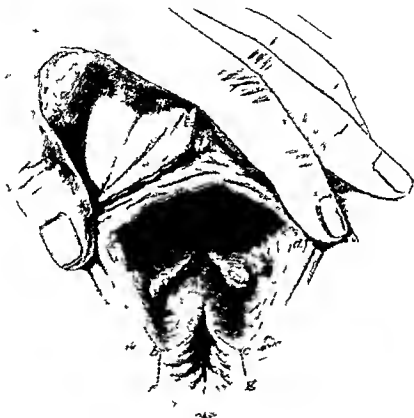


FIG. 72. Complete tear of the perineum. The dotted line illustrates the position of the incisions made in the operation of repair. The dimples adjacent to (b) and (c) mark the situation of the cut edges of the external sphincter. (Jellett and Tottenham.)

must be paid to the sphincter ani muscle, and several catgut sutures should be used to draw the cut edges together. It is usually found necessary to close the lower part of the anal canal and the skin of the anus after the sphincter ani muscle has been sutured. The tears in the vaginal wall and in the skin of the

perineum are now repaired with interrupted catgut sutures. Care should be taken to avoid tying the sutures too tightly, as a moderate amount of œdema of the perineum almost always develops, and undue tension may afterwards lead to severe pain, and may cause the stitches to slough away. If a complete tear of the perineum is treated by immediate suture, the end results are good if good anatomical reposition has been attained, although it is not uncommon for the superficial part of the wound to break down, particularly if the labour has been prolonged or if puerperal sepsis develops.

Old standing complete tears of the perineum usually result from careless attempts at immediate suture. Various degrees of complete perineal tears may be found. The rectal wall may be torn through as high as 2 in. or more along the posterior vaginal wall but in most cases only the anal canal is involved. The appearance of the perineum in cases of complete tear is characteristic. The red glistening mucous membrane of the anal canal and rectum protrudes and fuses directly with the vaginal wall without any of the perineal tissues intervening. Laterally, on each side, on a level with the anus, is a depression in the skin which corresponds to the position of the cut edge of the torn external sphincter (Fig. 72). Behind the anus are radial folds in the skin which is corrugated by the underlying contracted external sphincter.

One of the most interesting features of complete tear of the perineum is that it is very rarely, if ever, associated with prolapse. Although the decussating fibres of the levator ani muscles have been torn through prolapse is hardly ever, if ever, seen in cases of complete tear. The reason is that the patient continuously draws together the two levator ani muscles in an effort to close the bowel, so that by constant use the tone of the muscles becomes exceptionally good. This firmness and good development of the levator muscles is found on clinical examination when the levators are palpated.

Treatment

The treatment of complete tear of the perineum is operative. The technical difficulties are much greater in old cases than in those operated upon immediately after delivery. The optimum time for operation in the case of old tears is about ten weeks

after delivery. If operation is attempted earlier than this, healing by first intention is exceptional, while if operation is further delayed, dense scar tissue may be deposited which adds

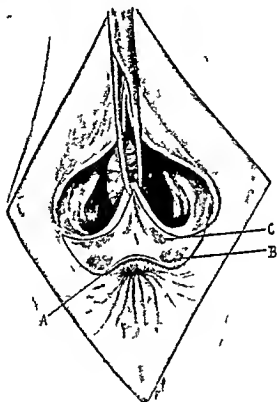


FIG 73 Operation for repair of a complete perineal tear. An area of scarred skin is excised and the mucous membrane of the anal canal freshened at the edge. The rectum is then mobilised and pulled down. Three structures must be defined free of scar tissue and mobilised—namely A the mucous membrane of the anal canal, B the external sphincter, and C, the levator ani muscles. First the edges of the anal canal mucosa must be sutured together then the cut edges of the sphincter and lastly the levator muscles must be sutured together. Afterwards the cut edges of the posterior vaginal wall and the skin of the perineum are sutured.

to the operative difficulties. Pre-operative preparation is of importance, and the patient should be kept in bed for several days prior to the operation, during which time the bowels should be emptied with purges and enemata and the vagina disinfected by douching and by the insertion of gauze packs soaked in

flavine 1 in 1,000. Various techniques have been described in the operative treatment of complete tears of the perineum, but the underlying principles are the same in all. The rectum must be separated from the vagina by incising the intervening scar tissue, and by dissecting upwards in the recto vaginal septum. Perhaps the most important step of all in the operation is to dissect the rectum clear of scar tissue, and to mobilise it so that it can be brought down, without tension, to the anal region. The tear in the rectum and anal canal is now repaired by excising scar tissue, freshening the cut edges and suturing them together with interrupted catgut sutures tied within the bowel. The needles, forceps and scissors used during this step are now discarded. The wound in the bowel is now invaginated with a layer of interrupted Lembert's sutures. Next, the deep muscles of the perineal body are identified and sutured together with strong catgut. Again it is important to ensure that the muscles are dissected clear of scar tissue, and are mobilised, for if any layer is sutured under tension because of adhesions to scar tissue, the operation is likely to be unsuccessful. The next important step in the operation is to suture together the torn edges of the external sphincter. These must be carefully defined, dissected clear of scar tissue and sutured together with three or four separate sutures. The remains of the superficial muscles of the perineum are now sutured together with catgut and then the cut edges of the vagina and perineum are repaired, interrupted catgut sutures being used. These principles are uniformly followed in the various methods described for the treatment of complete tear of the perineum. Modifications depend solely upon the position of the incisions made in the vaginal walls and in the skin of the perineum, and these, in their turn, depend not upon any particular technique, but upon the type of complete tear which is to be repaired. In some cases a flap can be brought down from the posterior vaginal wall and fashioned into a new anterior wall for the rectum and anal canal. The perineal muscles and the external sphincter are then sutured in front of this flap.

After-treatment. The patient is nursed on her back and for the first few days after operation the knees are tied together with broad bandages, partly to prevent digital interference by the patient, and partly to avoid tension on the wound by wide separation of the thighs. The most important part of the after-treatment is to keep the wound dry. The perineum should be

irrigated and swabbed after micturition and defecation, the best results being obtained if the wound is swabbed with spirit and subsequently powdered. The bowels should be confined until the fifth day after the operation. Prior to this time a non-residue diet of thin soups, fluids and fruit juice should be given. On the fourth day the patient is given liquid paraffin by mouth and on the evening of the fourth day a purge such as 1 oz. of castor oil, should be administered. The faecal material in the rectum should be softened by the injection of an olive oil enema. If the wound heals by first intention, the patient can get up on the fourteenth day. If the wound breaks down and suppurates the patient should be given hot baths and astringent lotions should be applied to the granulating areas. An ointment containing 2 per cent silver nitrate applied locally is a useful method of treatment in such cases. Even if the wound breaks down, the end result is usually good, although it is not uncommon for a small vagino-perineal fistula to develop. A subsequent recto-vaginal fistula is usually the result of bad technique. As in all operations on the perineum retention of urine is a common complication, so that it may be necessary to catheterise the patient on the day following the operation.

Incomplete Tears of the Perineum Old incomplete tears of the perineum are not treated surgically except when associated with prolapse of the vaginal walls.

Recto-vaginal Fistula

The majority of recto-vaginal fistulas result from obstetrical injuries the most common of these injuries being a complete tear of the perineum which has been imperfectly sutured immediately after delivery. It has already been pointed out that the repair of a complete tear of the perineum should be undertaken carefully, with the patient in the lithotomy position under anaesthesia. If, for instance, a few sutures are placed through the lower part of the anal canal and the upper part of the tear in the rectum is not accurately sutured, a fistulous opening may form between the rectum and vagina even though the tissues around the external sphincter may unite. Again, recto-vaginal fistula may result from operations for old complete tears of the perineum if the wound breaks down or if the rectum is not properly mobilised prior to the repair of the wound in the rectal wall. Such fistulas ensue upon the operation of

perineorrhaphy in thin, elderly patients when the anterior wall of the rectum is accidentally opened up

Other and more rare causes of recto vaginal fistula are syphilis and tuberculosis, esthiomene, carcinoma of the vagina and carcinoma of the rectum

In cases of pelvic abscess when there is a collection of pus in the pouch of Douglas, the abscess usually bursts into the rectum and a recto-vaginal fistula may develop, particularly if the abscess is opened up through the posterior fornix of the vagina

Congenital recto-vaginal fistula is seen from time to time as the result of mal-development of the lower part of the rectum and anal canal

In such cases it is customary to perform a preliminary colostomy before plastic operations are performed

Treatment

The traumatic form of recto-vaginal fistula is treated by operation

Pre operative treatment is important and the bowels should be

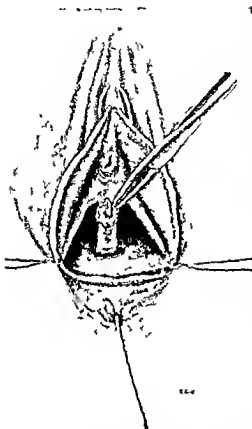


FIG 74 Operation for recto vaginal fistula.
Vernon David's method (After Jeff Miller)

emptied with purges and enemata, and the vagina disinfected with douches and gauze packs soaked in antiseptic solutions

With small recto-vaginal fistulas two simple procedures are available, which give very good results

The Vernon David method The fistulous tract between the vagina and rectum is mobilised from the vagina

A circular incision is made around the fistulous opening in the vagina and

VAGINAL LACERATIONS

the fistula with its fibrous wall dissected clear of the surrounding tissues until the rectal wall is reached. A probe is now passed through the anus along the fistula into the vagina. A purse string suture is placed around the vaginal opening of the fistula and threaded through a hole in the probe. The probe is now withdrawn so that the fistula becomes invaginated into the rectum and drawn out through the anal orifice. The anterior rectal wall is next reinforced with a few Lembert's sutures and the perineal muscles brought together between the vagina and the rectum. The wound in the vagina is now closed with interrupted sutures. The fistulous tract can either be left to slough away of its own accord or it may be excised.

The Ristiae-Nobel technique. In this method a midline incision is made through the perineum, starting above the level of the recto vaginal fistula and extending downwards to the anus. The incision passes through both the muscles of the perineum and the external sphincter until the anterior wall of the rectum is exposed. The rectum is dissected clear of scar tissue and mobilised. It is now pulled down until the fistulous opening in the rectum is below the level of the cut external sphincter. The cut perineal muscles and the external sphincter are now sutured together and the wound in the vaginal wall and in the skin of the perineum closed with interrupted sutures. The fistulous opening in the rectum now lies below the level of the external sphincter, and the redundant tissues of the rectal wall, including the fistulous opening into the rectum, are excised and the healthy tissues of the rectal wall sutured to the skin of the anal canal.

Large Recto-vaginal Fistulas When the opening between the vagina and rectum is large the condition must be treated by wide incision, the rectum separated from the vagina and the same technique employed as in dealing with cases of old complete tears of the perineum.

Vaginal Lacerations

Vaginal lacerations have already been mentioned in the previous chapter. The most extensive lacerations are caused by forcible rotation of the head with forceps when spiral tears may be produced by the blades. In most cases the laceration is restricted to the vaginal walls and good union is obtained if the tear is immediately sutured with catgut. Suppuration in the

wounds may lead to the development of a cellulitis of the para vaginal connective tissues. Another form of vaginal laceration is that seen in extensions from lacerations either of the cervix or of the perineum. It is not uncommon for laceration of the lower third of the posterior vaginal wall to be produced during child birth although the skin of the perineum remains intact. In such cases a small amount of hæmorrhage prior to the birth of the head is usual. Such lacerations are often overlooked, for they cannot be seen unless the labia are separated and the posterior vaginal wall inspected. The muscles of the perineal body may be torn through to some degree, even although the skin of the perineum remains intact. Prolapse of the posterior wall often results from tears of this kind. The repair of this type of laceration is more difficult than that of the commoner form which involves the skin of the perineum. It should, therefore, be undertaken immediately after delivery, and it may be necessary to place the patient in the lithotomy position.

Lacerations of the Cervix

A minor degree of laceration of the cervix during a first delivery is to be regarded as normal for the thin layer of circular fibres which surround the external os is torn through before the cervix becomes fully dilated so that an anterior and a posterior lip of the cervix subsequently become differentiated. It is possible that part of the hæmorrhage of the "show" is produced by small tears of the cervix occurring at the beginning of the stage of dilatation. Severe lacerations of the cervix are uncommon except as a result of obstetrical interference. Scars of the cervix caused by such operations as trachelorrhaphy, may break down and lead to extensive tearing during child birth. The most usual cause of severe laceration of the cervix is forceps delivery prior to full dilatation but the condition may result from rapid extraction of the breech and the after coming head before full dilatation. The most dangerous form of all, because of the risk of hæmorrhage from the torn lower uterine segment, results from excessive traction on the half breech after bipolar version has been employed in the treatment of placenta prævia. If the laceration is restricted to the vaginal portion of the cervix a moderate amount of hæmorrhage ensues which is usually spontaneously controlled either by clotting or by retraction of the muscle tissue of the cervix. If, on the other hand, the

laceration extends to the vagina, the cervico-vaginal branch of the uterine artery may be injured and cause severe hæmorrhage. In such cases, the diagnosis is usually made without difficulty, for the severe vaginal bleeding continues when the uterus is hard and retracted. Such hæmorrhage cannot be controlled unless the patient is placed in the lithotomy position, the vaginal walls retracted and the lacerations repaired with sutures. As a temporary measure a pair of volsellum forceps should be applied to each lip of the cervix, and by the application of traction the uterine artery is kinked and the hæmorrhage controlled until the patient can be anaesthetised and preparations made for suture of the laceration. The suturing of such lacerations must be carried out with care, for it is possible to include the ureter in a suture. In some cases the hæmorrhage is uncontrollable by suture and the laceration must be tightly packed with sterile gauze.

The cervix may also be split either anteriorly or posteriorly if forceps are used prior to the full dilatation of the os. In lacerations of the anterior lip of the cervix, the tear is usually restricted to the cervix, but with tears of the posterior lip, the lacerations frequently extend backwards to the posterior vaginal wall. Such lacerations heal well if sutured immediately after delivery. The cervix is not always inspected after an instrumental delivery of this kind and the lacerations are left to heal by granulation, with the result that the cervix is eventually scarred, fibrosed, and chronically inflamed.

A rare complication of delivery arises when almost the whole of the vaginal portion of the cervix is detached during delivery. Such cases are very rare and the etiology of the condition is unknown. The detachment may arise in primiparae when the cervix has appeared to be healthy. Usually the labour has been prolonged unduly, and for some reason the external os fails to dilate.

End Results of Cervical Lacerations Unless cervical lacerations are repaired by immediate suture, they become infected, and lead to chronic inflammation of the cervix. In other cases the inflammation spreads deeply into the parametrium and the paravaginal tissues to give rise to parametritis which, at a later date, owing to the deposition of scar tissue, is responsible for chronic backache and pelvic discomfort. Chronic cervicitis causes hypertrophy and fibrosis of the cervix, the active inflammation of the glands producing a discharge of mucus and pus.

from the cervical canal. In the process of healing of cervical lacerations the columnar epithelium of the cervical canal grows over the raw areas of the vaginal portion of the cervix and produces erosion of the cervix. Sometimes the cervix is extensively lacerated on each side so that both lips become everted, with columnar epithelium covering a large part of each lip of the cervix. This condition, termed *ectropion*, is extremely common. The treatment consists in repair of the cervix by the operation trachelorrhaphy (p. 368). The treatment of cases of chronic cervicitis and of lacerations of the cervix will be dealt with in the chapter on inflammations of the cervix (Chap. XVII).

Urinary Fistulas

In women, most urinary fistulas result either from trauma during child birth or from injury to the urinary tract during gynaecological operations. The commonest form of fistula is vesico-vaginal, in which there is a communication between the bladder and the upper third of the anterior vaginal wall. Next in order of frequency is uretero vaginal fistula which is usually caused by injury to the ureter during gynaecological operations. Other forms of urinary fistula are recognised and can be classified as follows —

Vesical Fistulas

<i>Vesico vaginal</i>	/	V
<i>Vesico cervical</i>		h
<i>Vesico abdominal</i>		
<i>Vesico-intestinal</i>		!

Ureteral Fistulas

<i>Uretero vaginal</i>	
<i>Uretero cervical</i>	!
<i>Uretero abdominal</i>	

Vesico-vaginal fistula is usually the result of a difficult labour in cases of disproportion between the size of the head and the dimensions of the pelvis. The head is delayed in its descent through the pelvis and compresses the anterior vaginal wall or the undilated cervix against the back of the symphysis pubis. As the result of prolonged pressure the tissues undergo necrosis and slough away on about the fifth day of the puerperium,

which leads to a fistulous communication between the bladder and vagina. Similarly, in cases of disproportion, if the membranes have ruptured prematurely the cervix may become compressed against the back of the symphysis pubis so that its anterior lip undergoes necrosis and a vesico cervical urinary fistula results. It is rare for uretero vaginal or urethro vaginal fistulas to be caused by direct compression during child birth, for the ureter is usually displaced upwards above the brim of the pelvis and the urethra lies too far down to be compressed. Most pressure is exerted at the level of the brim of the pelvis.

Urinary fistulas may also be caused during obstetrical operations such as forceps delivery, the use of perforators and cranioclats, and by spicules of the foetal skull from direct trauma. In such cases the fistula develops immediately after delivery. Vesico-vaginal fistula may follow gynaecological operations such as anterior colporrhaphy, total hysterectomy or Wertheim's operation, if the bladder has been injured and imperfectly sutured. Similarly, urinary fistulas may develop after operations of this kind if a ligature has included part of either the bladder or ureter, for the tissues slough and lead to fistula formation. Urinary fistulas sometimes result from long retained pessaries ulcerating into the bladder. Congenital urinary fistulas between the bladder and vagina are sometimes seen, and implement injuries in which pointed objects penetrate into the bladder from the vagina may also lead to a vesico vaginal fistula. Urinary fistulas often develop in late cases of carcinoma of the cervix and carcinoma of the vagina. Vesico vaginal fistula as a complication of carcinoma of the bladder is very rare, but vesico vaginal fistula caused by a stone in the bladder ulcerating through into the vagina is sometimes seen.

Uretero vaginal fistula is usually caused by injury to the ureter during gynaecological operations, when the ureter may be *either divided, wounded, or included in a ligature*. If the lumen of the ureter is opened a urinary fistula develops immediately, the urine leaking either through the vagina or through the abdominal wall if the peritoneal cavity has been drained. If the ureter is completely occluded by the ligature the kidney tissues atrophy. More frequently, however, after inclusion of part of the ureter in a ligature the patient develops a high temperature immediately after the operation, and a urinary fistula develops about the twelfth day after the operation as the result of sloughing of that part of the ureter included in the ligature.

The symptoms of urinary fistula are caused by the continuous flow of urine from the vagina. The incontinence of urine is a true incontinence and must be distinguished from the imperfect control of micturition due to a relaxed sphincter, from the frequent micturition of cystitis and from retention overflow. There is often difficulty during the puerperium in determining whether incontinence of urine is caused by a fistula or whether it is due to imperfect control. Imperfect control of micturition, caused by laxity of the sphincter at the base of the bladder and by a relaxed anterior vaginal wall, is not uncommon during the puerperium, and the urine dribbles away when the intra-abdominal pressure is raised during coughing or straining. If such patients are questioned, it will be found that they are able to retain urine for short periods of time and to pass urine voluntarily, although the amount passed may be small. Similarly, there may be difficulty in diagnosis in cases of stress incontinence of urine at a later date, but again it will be found that such patients are able to retain urine in the bladder and to void it voluntarily although the amount retained may be small.

The constant trickle of urine down the vagina produces vaginitis and vulvitis with attendant soreness and pruritus. Incrustations of phosphates may form in the vagina and in old standing cases there may be extensive excoriation of the skin of the vulva region.

The diagnosis of urinary fistula often requires careful investigation. Care must be taken to distinguish between imperfect control due to a relaxed sphincter and the true incontinence of a fistula. With urinary fistula the urine continuously dribbles away and the patient has no control of any kind. A vaginal examination may enable a vesico vaginal fistula to be palpated. With puerperal cases a large fistula may be present which is easily palpable through the anterior vaginal wall, and in severe cases most of the anterior vaginal wall may have sloughed away. In most puerperal cases the fistula measures about $\frac{1}{4}$ in across. The fistula may be seen during speculum examination and a vesico vaginal fistula can be diagnosed if a sound is passed through the urethral meatus into the bladder and by way of the fistula into the vagina. If the fistula is small and surrounded by scar tissue, further investigations must be made. The vagina should be swabbed dry and a solution of methylene blue run into the bladder by means of a catheter and funnel. If the blue solution can be seen to trickle into the vagina the diagnosis

of vesico vaginal fistula is established. If, on the other hand, urine still trickles into the vagina but is not stained blue, the fistula must be uretero vaginal. A simple method of investigation is to insert two gauze swabs into the vagina, then to empty the bladder with a catheter and to introduce a methylene blue solution into the bladder by means of a catheter and funnel and to wait a few minutes. The first swab is usually contaminated with the blue solution when the bladder is being filled. This swab should be removed and the second swab examined. If the second swab is stained blue the fistula must lie between the bladder and the vagina or cervix. If, on the other hand, the second swab is soaked with clear urine, the fistula must be ureteral. Cystoscopic examination will enable the diagnosis of uretero vaginal fistula to be established, for in such cases there will be either no efflux from the affected side or the efflux will be scanty and irregular. Small vesical fistulas can be recognised by cystoscopic examination, but the method of investigation is useless in cases of large bladder fistulas because of the impossibility of distending the bladder.

Treatment. Small urinary fistulas sometimes heal spontaneously during the first few weeks of their existence. For this reason operations for repair should be delayed for at least six weeks after the fistula has developed. Ureteric fistulas following Verheem's operation should be left for three months before being treated by surgery. During the interval the patient should be treated by the administration of citrates and large quantities of bland fluids. Vaginal irrigations should also be given to reduce the chances of the development of an ascending urinary infection. The method of cauterising the edges of urinary fistulas is seldom satisfactory, and it may induce an ascending infection of the urinary tract.

Urinary fistulas which do not heal within six weeks must be treated surgically. Before operation is undertaken local sepsis must be cleared up by vaginal irrigations and by the administration of urinary disinfectants. If the operation is performed carefully with correct technique the results are good. If, on the other hand, the operation is performed too soon, before the uterine discharges have cleared up and if the wound becomes infected, or if the wrong operative technique is employed, the fistula may recur. Later attempts at closure are always difficult, and the more unsuccessful operations previously performed to heal the fistula, the worse the prognosis. If dense scar tissue of

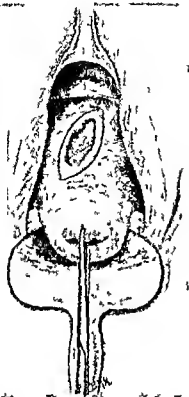


FIG 75 Operation for repair of a vesico-vaginal fistula. A good exposure is essential. The cervix must be pulled down with vulsellum forceps and a retractor inserted to draw away the lower part of the anterior vaginal wall. The fistula is exposed, an incision made around it through the vaginal wall. The vaginal tissues contained within the incision are excised and the edges of the bladder carefully freshened. (After Weibel.)

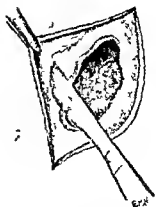


FIG 76 The next step is to mobilise the bladder. This is carried out by separating the vagina from the bladder as shown. The bladder must be freely mobilised if the operation is to succeed. (After Weibel.)

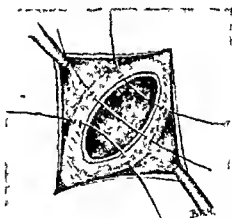


FIG 77 The method of introducing sutures into the bladder. (After Weibel.)

cartilaginous hardness surrounds the fistula as the result of previous attempts at closure, the prognosis may be hopeless, however skilful the operator and however ingenious his technique.

Pre operative treatment with vaginal irrigations and the administration of urinary antiseptics is always carried out. It is necessary always to obtain a good exposure of the fistula. Marion Sims employed the Sims position to get a good exposure of the anterior vaginal wall. At the present day it is customary to place the patient in an exaggerated lithotomy position with the pelvis raised above the level of the head. Vaginal retractors are required, and, if the vagina is small, it must be enlarged by means of a Schuchardt's incision through the lateral part of the perineum. The most difficult cases of bladder fistula are those following total hysterectomy when the fistula lies amongst the scar tissue at the top of the vagina. The old method of using silver wire, introduced by Marion Sims, has been replaced by plastic operations.

The best method to adopt is to make a circular incision around the fistula and to separate the vagina from the bladder. The next step, the most important of all, is to mobilise the bladder through this incision so that the wound in the bladder can subsequently be invaginated without tension. After the bladder has been adequately mobilised the edges of the fistula are freshened. The simplest technique is to insert two guiding sutures through the bladder wall at two ends of the fistula and then to excise the scar tissue at the rim of the fistula with a sharp tenotomy knife. The bladder is now invaginated by a layer of interrupted sutures of fine catgut which do not include the mucous membranes of the bladder but which pass through the muscle wall of the bladder along the freshened edges. A second reinforcing series of interrupted Lembert sutures should now be inserted. The vagina is then closed with interrupted catgut sutures. Suture material throughout the operation should consist of catgut.

A method which is technically very simple is sometimes successful. A circular incision is made around the fistula at a distance of about 1 cm from its margin. The vaginal wall which lies outside this incision is now separated from the bladder and the bladder mobilised as before. Interrupted Lembert sutures are now introduced through the raw surface of the bladder so that when tied the circular flap of the vaginal wall is invaginated. The method is technically very simple and good results have been claimed.

In some cases of vesico vaginal fistula it may be necessary to open the abdomen before the bladder can be adequately

mobilised. In other cases the operation of colpoceleisis has been performed in which, by means of a circular incision around the middle of the vagina, the upper part of the vagina is shut off to form a diverticulum of the bladder. With extensive vesico vaginal fistulas it may be necessary to use a cylindrical skin graft taken either from the abdominal wall or from the thigh before the wound in the anterior vaginal wall can be repaired. In intractable cases it may be necessary to implant the ureters into the intestine by Coffey's method.

The after treatment of operations of vesico vaginal fistula is important. A self retaining catheter should be used for at least eight days, the catheter being changed each day. During this time the patient should be given urinary antiseptics and large quantities of fluid. Care must also be taken to prevent infection of the vaginal wound, and it may be necessary to give vaginal irrigations if a vaginal discharge develops.

Ureteric Fistula

If the ureter has been completely occluded, the kidney atrophies. If the occlusion is partial, a hydronephrosis develops which usually becomes infected. If the ureter has been wounded and a ureteric fistula develops, an ascending infection to the pelvis of the kidney is very common. The ideal treatment of uretero vaginal fistula is to implant the ureter into the bladder by the abdominal route. The operation is relatively simple with the modern method of using Kidd's catheter, and even the old Wertheim technique gave good results. The difficulty is that with most cases of uretero vaginal fistula some degree of kidney infection is present. In such cases the fistula must be treated by removing the kidney. Care must be taken, of course, to ensure that the opposite kidney is functioning normally.

CHAPTER X

DISEASES OF THE URINARY SYSTEM

URINARY symptoms are frequently complained of by gynaecological patients. Sometimes the symptoms can be attributed to lesions of the genital tract, at other times they depend upon abnormalities of the urinary organs. It is important, therefore, to indicate clearly which urinary symptoms are caused by gynaecological disorders and how such cases can be distinguished from diseases of the urinary system.

Retention of Urine ✓

With the exception of post-operative retention and the retention of urine after child birth, the common causes of retention of urine in woman are a retroflexed gravid uterus and a myoma impacted in the pelvis. Hysterical retention of urine is rarely seen at the present day. Post-operative retention may follow abdominal, vaginal and rectal operations. After vaginal operations it may result from spasm of the bladder sphincter from injury. After abdominal operations, abdominal pain caused by straining may be responsible for the retention. At other times, patients may find that their posture in bed prevents them straining naturally to evacuate the bladder. After rectal operations, the spasm of the bladder sphincter is reflex. In post-operative retention it may be necessary to catheterise the patients during the first few days after operation, during which time the patients should be given citrates and sulphanilamide. Most patients micturate naturally within a few days of operation.

Retention of urine during the first few days of the puerperium is fairly common. Probably it results from pressure upon the nerves around the base of the bladder as the foetus passes through the pelvis, or perhaps from bruising with consequent spasm of the sphincter at the base of the bladder. Other factors such as laxity of the abdominal walls, nervousness, pain during micturition, also promote retention in puerperal cases. If possible, frequent catheterisation should be avoided because of the risk of infection. Very rarely, it may be necessary to

catheterise the patient for some days or even weeks after delivery

Other cases of retention of urine are rare it may complicate disease of the spinal cord; it may be produced by pelvic tumours such as the pelvic hæmatocele of ectopic gestation, small ovarian cysts impacted in the pelvis, hæmatocolpos, or it may be caused by inflammatory swellings in the pouch of Douglas. Strictures of the urethra and stone in the urethra are rare causes of retention

Retention due to a retroflexed gravid uterus is encountered relatively frequently. It develops between the 12th and 14th weeks of pregnancy, when the enlarged retroflexed uterus lies in the pelvic cavity. The anterior vaginal wall and the attached urethra are stretched as the body of the retroflexed pregnant uterus sinks low into the pelvic cavity. Sometimes the urethral meatus itself may be drawn upwards into the vagina. The retention is probably produced not by direct pressure on the urethra, for a soft catheter can be passed into the bladder without difficulty. Stretching of the urethra and of the neck of the bladder are responsible for the retention, whether by occlusion of the lumen of the urethra or by disturbance of the reflex mechanism of evacuation of the bladder is uncertain. After the fourth month of pregnancy the uterus has grown out of the pelvis, and there is no longer danger of retention. The diagnosis of retention of urine, due to a retroflexed gravid uterus, depends upon the identification of the abdominal tumour as the distended bladder and the pelvic tumour as the pregnant uterus. In pelvic hæmatocele due to ectopic gestation, a similar picture may be produced, for retention of urine may develop through the presence of a large swelling in the pouch of Douglas, and the hæmatocele may be mistaken for the retroflexed gravid uterus. Again, the uterine hæmorrhage of ectopic gestation may be mistaken for the moderate amount of hæmorrhage which not uncommonly appears in cases of retroflexed gravid uterus. A history of severe abdominal pain is invariable in cases of ectopic gestation, and the characters of the swelling in the pouch of Douglas in the case of pelvic hæmatocele are palpably different from those of the retroflexed gravid uterus. The diagnosis can be established once the bladder has been emptied with a catheter, for, in cases of pelvic hæmatocele, the uterus can be palpated separate from the swelling in the pouch of Douglas.

The treatment of retention of urine due to a retroflexed gravid uterus is slow evacuation of the bladder. The patient should be put to bed, a self retaining catheter inserted into the bladder, and the urine allowed to pass into a receptacle under the bed through a long piece of rubber tubing. The rate at which the bladder is emptied is controlled by means of a screw clip attached to the rubber tubing. The evacuation should be controlled so that at least thirty six hours is spent in the process. It will then be found that the uterus has righted itself spontaneously to its normal position of anteversion and ante flexion. If the bladder is emptied rapidly, there is not only danger of hæmorrhage from the urinary tract, but the uterus will remain retroflexed with the possibility of further development of retention, unless the uterus is replaced. The replacement of a retroflexed gravid uterus large enough to have caused retention of urine is extremely difficult. The method usually adopted is to push up the uterus with two fingers in the posterior fornix, with the patient placed in the genu pectoral position. Another method is the application of traction on the anterior lip of the cervix with volsellum forceps, the body of the uterus being pushed upwards again by two fingers placed in the posterior fornix. A third method is to insert a hydrostatic bag into the vagina with the patient placed in the Trendelenberg position and to fill the bag with mercury. These procedures are unnecessary, for if the bladder is emptied slowly, the uterus will right itself spontaneously.

If the retention of urine has been present for some time, a severe degree of cystitis may develop which has been known to lead to gangrene of the mucous membrane of the bladder, so that the whole of the lining of the bladder may slough away. The danger of severe cystitis of this kind is ascending infection of the kidneys with subsequent pyelonephritis and uræmia.

Retention due to Myomata. Cervical myomata and myomata of the posterior wall of the uterus which are located below the promontory of the sacrum may cause retention of urine by pressing the neck of the bladder against the symphysis pubis. Treatment consists in slow evacuation of the bladder, followed by surgical removal of the tumour.

Difficult Micturition

Difficulty in emptying the bladder is a symptom present in those conditions already mentioned which eventually produce

catheterise the patient for some days or even weeks after delivery.

Other cases of retention of urine are rare—it may complicate disease of the spinal cord; it may be produced by pelvic tumours such as the pelvic hæmatocele of ectopic gestation, small ovarian cysts impacted in the pelvis, hæmatocolpos, or it may be caused by inflammatory swellings in the pouch of Douglas. Strictures of the urethra and stone in the urethra are rare causes of retention.

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Difficult Micturition

Difficulty in emptying the bladder is a symptom present in those conditions already mentioned which eventually produce

retention of urine. It also arises in cases of new growths of the bladder and urinary calculi. One of the commonest of the gynaecological causes of difficulty of micturition is a severe degree of prolapse of the anterior vaginal wall. When such patients strain to micturate, the anterior vaginal wall prolapses and carries down with it the bladder, so that a large sacculation of the bladder comes to lie below the level of the external urinary meatus. The more the patient strains the less likely is she to empty her bladder, for the bladder urine is forced down into the cystocele instead of through the urethra. The only way the act of micturition can be started by the patient is pushing back the prolapsed anterior vaginal wall. Treatment consists either in anterior colporrhaphy or in the introduction of a pessary.

Painful Micturition

Pain may be present either during or immediately following the act of micturition. Gonococcal urethritis causes scalding pain as the urine passes over the inflamed mucous membrane. Other causes of painful micturition are tender caruncles at the meatus, prolapse of the urethral mucous membrane, diseases of the vulva such as kraurosis and carcinoma and carcinoma of the urethral meatus. Painful micturition is a prominent symptom in cystitis, the pain is experienced at the end of micturition when the inflamed surfaces of the bladder come into apposition. Further diseases of the bladder which cause painful micturition are villous papillomata, carcinoma, tubercle and stone. The urine should be examined chemically in all cases where the symptom is present, for a highly acid urine alone may cause pain during micturition.

Frequency of Micturition

Frequency of micturition is one of the commonest symptoms complained of by gynaecological patients, and although many causes of frequency lie in the urinary tract, a large number are gynaecological. Frequency of micturition is present when the patient passes an excessive amount of urine, as in diabetes mellitus and diabetes insipidus. The symptom always develops with cystitis, whatever the cause of the cystitis may be, whether a bacillus coli infection, tubercle infection, stone or growth. Frequency of micturition is a normal symptom of early pregnancy and develops again during the last few weeks when the

presenting part has entered the pelvis. Pressure upon the bladder by pelvic tumours such as myomata of the uterus and ovarian cysts also cause frequency. The symptom is often complained of by patients with cystocele, mainly because a chronic cystitis is usually coincident. Inflammatory swellings around the bladder as in parametritis and inflamed appendages also lead to frequency. Infiltration of the bladder by carcinoma of the cervix or of the vagina may induce frequency of micturition. Other causes are oxaluria, bacilluria, stone in the kidney, and the symptom also develops in retention overflow when the bladder is over distended.

The investigation of a case of frequency of micturition requires, in addition to the usual gynecological examination, a complete examination of the urine, cystoscopy and X rays photography, if no obvious cause for the frequency is found.

Incontinence of Urine

In true incontinence of urine, the urine which passes down the ureters is discharged involuntarily and continuously so that the patient is constantly wet, and the bladder is always empty without residual urine. In false incontinence, urine is retained in the bladder but only partially. The two types of case are distinct. True or complete incontinence of urine is present in cases of urinary fistulas, in malformations such as ectopia vesicæ, in some diseases of the spinal cord, and in the rare cases of patulous urethra.

False or partial incontinence is much more common. It is exemplified by the nocturnal enuresis of young girls when the urine is voided during sleep and when such local reflex causes as threadworms and rickets may be found. One of the commonest types of partial incontinence is the stress incontinence of patients with prolapse of the anterior vaginal wall when the patient voids urine involuntarily while sneezing, coughing or laughing. The condition often develops immediately after delivery during the first weeks of the puerperium, although the majority of cases are seen at a later date. The cause of stress incontinence is laxity of the sphincter at the base of the bladder produced by prolapse of the anterior vaginal wall. The sphincter at the base of the bladder is attached anteriorly to the back of the symphysis pubis while posteriorly it is adherent to the vagina, so that if the anterior vaginal wall prolapses, the sphincter is

stretched. Laxity of the sphincter produced by stretching and atony is the essential cause of stress incontinence. Stress incontinence will be described in detail in Chapter XVIII.

Partial incontinence is seen very rarely in patients without local abnormality, when it may be due to a congenital weakness of the vesical sphincter. Various types of plastic operations have been performed to tighten up the sphincter muscle, and good results have been reported after electricity has been used to stimulate the muscle and to increase its tone.

Cystitis

The female urethra always contains micro organisms, and coliform bacilli, streptococci, staphylococci and Döderlein's bacilli should be regarded as its normal inhabitants. These micro organisms, however, do not cause urethritis unless the urethral tissues are damaged, nor do they spread upwards to the bladder unless they are carried up during catheterisation. Even then they are only apt to cause cystitis if the bladder wall has been damaged by injury. Another method of infection of the bladder is by the descent of the infection from the kidney, illustrated by tubercle infection and by the cystitis of bacilluria. Organisms may also spread to the bladder from adjacent structures, such as inflamed uterine adnexa and parametric effusions. The bladder may perhaps be infected by way of the blood stream, and in other cases by lymphatic spread from the genitalia or bowel. The organisms found in the urine in cases of cystitis are the bacillus coli, streptococci, staphylococci, the bacillus proteus, the tubercle bacillus and occasionally other organisms. Gonococcal cystitis is relatively rare and almost invariably follows instrumentation. The organism which is found most frequently is the bacillus coli communis. This organism is now supposed to attack the bladder secondarily to an original infection by other organisms and subsequently to overgrow and replace the primary infection. On the other hand, it is well established that cystitis due to a primary bacillus coli infection is seen from time to time.

The symptoms of cystitis are painful and frequent micturition, pain over the bladder, strangury and the passage of pus in the urine. As the bladder fills up with urine its sensitive inflamed mucous membrane causes pain and a desire to micturate. Pain is also experienced at the end of the act of micturition when the

CYSTITIS

adjacent inflamed surfaces of the bladder come into contact. In urethritis pain is experienced during the act of micturition whereas in cystitis severe pain is experienced after the urine has been voided. Frequency of micturition may be extreme the patient having to pass urine every fifteen minutes. The symptoms of acute cystitis are severe, and patients are deprived of sleep and soon become exhausted. The temperature is raised but it soon falls if proper treatment is employed. A persistent high temperature is usually due to the infection ascending to the pelvis of the kidney, causing pyelitis.

In chronic cystitis pain and strangury are less prominent symptoms but frequency of micturition and pyuria are always present. Chronic cystitis may persist for months or even years without causing other symptoms than frequency of micturition and pyuria.

The diagnosis of acute cystitis is made from the characteristic symptoms and by an examination of the urine. Difficulty may be experienced in distinguishing between acute urethritis and acute cystitis. In acute urethritis pain is experienced during the act of micturition. There is no abdominal pain or tenderness and frequency is not extreme. In both conditions the urine contains pus and organisms. In acute urethritis harm may be done by catheterisation or cystoscopy, for the instrumentation may carry infection to the bladder. Similarly the inflamed mucous membrane is easily damaged and bleeds easily. Urethritis can be distinguished by massaging the urethra against the back of the symphysis pubis, when pus will be expressed from the external meatus. Another simple method of distinguishing between acute urethritis and cystitis is the three glass test when in urethritis the third specimen will be clear of pus, but more contaminated with pus in cystitis. Instrumentation should be avoided as far as possible in acute urinary infections not merely because of the risk of an upward spread of the infection to the kidneys but because of the ease with which the bladder is injured.

Treatment. Cystitis must be treated by the administration of large quantities of fluids by mouth, at least 5 pints being taken every twenty four hours. Plain water, alkaline Spa waters, milk and weak tea should be given. Alcohol in any form is contra indicated for it aggravates the symptoms. In acute cases the patient must stay in bed and some relief may be obtained by the application of a hot water bottle over the bladder region.

Local treatment during the acute stage is contra indicated, for washing out the bladder may cause an ascending infection of the kidney. The pain is best treated with codeine and belladonna. Opium and morphia should be used sparingly, although they need not be withheld in severe cases. Large quantities of citrates should be given by mouth as much as 40 grains of potassium citrate being given two hourly by day. Citrates can be combined with benzoic acid, salol boric acid and magnesia.

In the last few years considerable advance has been made in the treatment of urinary infections. The ketogenic diet has been replaced by treatment with mandelic acid. The most recent preparations consist of ammonium mandelate and it is only in a few cases that ammonium chloride need be given in addition. Mandelux (British Drug Houses) is given in doses of 2 drams four times a day. The pH of the urine is tested with methyl red as indicator and only the simplest apparatus is required. When necessary the acidity of the urine can be increased by the administration of ammonium chloride. The treatment is contra indicated when there is evidence of renal insufficiency and care must be taken to ensure that the urine is not excessively acid otherwise there is a risk of casts appearing in the urine.

With mandelic acid treatment the fluid intake must be drastically reduced and patients should not be given more than $1\frac{1}{2}$ pints of fluid during each twenty four hours.

Urinary infections respond admirably to treatment with sulphanilamide and sulphapyridine. In all cases the urine must be made alkaline to obtain the full effect of this form of chemotherapy. Doses of the order of 2 to 4 gm per day are necessary. At the present day treatment by chemotherapy and with mandelic acid has replaced the old fashioned treatment mentioned above.

Bladder irrigations should be restricted to chronic cases, and the best solution to use is silver nitrate 1 in 8,000, which is gradually increased in strength until a tolerance is obtained to a concentration of 1 in 1,000. Other solutions, such as potassium permanganate and collargol are sometimes employed. Irrigations should be given only once a day, and well marked improvement is obtained within ten days.

Chronic cystitis caused by descending infections from the kidney can only be cured if the primary cause is dealt with.

CYSTITIS

Special forms of Cystitis encountered in Gynæcology

Some degree of injury to the bladder can often be detected on cystoscopic examination during the early days of the puerperium. Small submucous hæmorrhages are not uncommon, and Stoeckel has described œdema of the sphincter vesicæ.

Similar injuries are common after such operations as anterior colporrhaphy and total hysterectomy. Gangrenous cystitis as a complication of the retention of urine caused by a retroflexed gravid uterus has already been mentioned, and similar cases sometimes develop after puerperal retention. Gangrenous cystitis is often accompanied by some degree of pericystitis, so that an indurated swelling may be palpated in the abdomen over the bladder.

In parametritis the abscess may burst into the base of the bladder lateral to the trigone in which case the sudden discharge of pus causes severe urinary symptoms together with general disturbances. Inflamed uterine appendages sometimes become adherent to the peritoneal surface of the bladder when an adnexal abscess may be discharged into the bladder cavity. A persistent fistula results from this complication, unless the adnexa are removed, for the secretion of the mucous membrane of the Fallopian tube is continuously discharged into the bladder. Ovarian dermoids sometimes adhere to the bladder and a fistulous communication may develop and sebaceous material, and even hair, may be voided with the urine. Cases have been described in which ectopic gestations have become fixed to the bladder, so that foetal parts have subsequently been passed in the urine. Malignant ovarian tumours often infiltrate the peritoneal surface of the bladder, although it is rare for the growth to ulcerate through the bladder wall.

In carcinoma of the cervix infiltration of the bladder is common, and can be detected by cystoscopic examination. In the early stage a bullous œdema develops above the trigone owing to infiltration of the bladder lymphatics with the growth. In later cases an irregular depression can be detected, while in advanced cases the growth ulcerates into the bladder cavity.

In cystocele, the part of the bladder which prolapses is that which lies above the level of the inter ureteric ligament, and in early cases of cystocele a well marked pouch can be detected on cystoscopic examination.

be stenosed or abnormally patulous. In suitable cases plastic operations may be performed to remedy the defects.

Stricture

The lumen of the urethra may be congenitally small, but fibrous stricture is always acquired. A minor degree of stricture is not uncommon, but extreme degrees are very rare. Gonorrhoea, injuries during child birth, rarely syphilis and tuberculosis, and the application of caustics may cause the deposit of fibrous tissue around the urethra which by its subsequent contraction produces stricture. Malignant growths such as carcinoma of the vagina, carcinoma of the urethral meatus, and carcinoma of the vulva may infiltrate the wall of the urethra and lead to stricture. Some degree of stenosis of the urethra may follow gynaecological operations on the anterior vaginal wall. The symptoms of urethral stricture are difficulty in micturition combined with frequency. The diagnosis is easily made because of difficulty in catheterisation. Treatment consists in bougie dilatation. In difficult cases preliminary internal urethrotomy may be necessary.

Urethral Diverticula and Peri-urethral Abscess

In addition to Skene's tubules, a series of simple tubular glands and crypts are found along the course of the urethra which are regarded as being homologous with the prostate. In urethritis, small collections of pus may accumulate in these crypts and lead to peri urethral abscess, which usually bursts into the urethra itself. Similarly, small cysts of Gartner's duct deep to the anterior vaginal wall may become infected and burst into the urethra. If the epithelium of the mucous membrane of the urethra grows into these communications a diverticulum of the urethra results. Some urethral diverticula are regarded as congenital and cases have been described in which an accessory ureter has terminated in such a diverticulum. According to some authorities, the majority of urethral diverticula result from injuries to the urethra during child birth. The diagnosis of urethral diverticulum is made because the swelling can be emptied into the urethra. In addition, a small catheter or probe may be passed through the urethra into the diverticulum, and

urethroscopy allows the opening into the urethra to be seen. Treatment consists in excision of the diverticulum through an incision in the anterior vaginal wall but extreme care must be taken to repair the urethra otherwise a urethro vaginal fistula may develop.

Prolapse of the Urethral Mucous Membrane

Prolapse of the urethral mucous membrane at the external meatus may be total when a circular ring of mucous membrane



Fig. 78. A urethral caruncle. The caruncle is covered by epithelium. It is a transitional part transitional. The stroma is packed with round cells and contains glands which are lined by transitional epithelium.

prolapses or partial when the prolapse is restricted to the posterior part. The prolapsed mucous membrane is plum coloured and vascular and bleeds easily. Circular prolapse of the urethral mucous membrane is usually seen in children or in women after the menopause. Sixty per cent of cases arise in children, 22 per cent in women after the age of the menopause and only 12 per cent in women of the child-bearing period of life.

Little is known of the etiology. Almost invariably a history is obtained that the prolapse suddenly develops after straining.

The symptoms complained of are burning pain on micturition, urgency and in some cases frequency. As the result of the

vascularity of the mucous membrane a minor degree of hæmorrhage is sometimes complained of. The circular form of prolapse of the urethral mucous membrane is diagnosed because the swelling is arranged symmetrically around the meatus, whereas with caruncle and polypi the tumour is restricted to the posterior part. In cases of partial prolapse of the urethral mucous membrane there is often difficulty in distinguishing the condition from caruncle, for in both abnormalities the swelling is restricted to the posterior part of the meatus. A typical caruncle is pedunculated and forms a projecting swelling. Caruncles are



FIG. 79. Urethral caruncle.

far more tender than simple prolapse of the urethral mucous membrane. Carcinoma of the urethral meatus can be distinguished by its induration, and in later cases by fungation and ulceration. Treatment of prolapse of the urethral mucous membrane consists in excision of the redundant mucosa, care being taken to insert sutures in such a way as to prevent subsequent stenosis of the meatus. With children, such conditions as worms and constipation must be treated, otherwise the prolapse is apt to recur. Recurrences are nevertheless not infrequent after operation upon children, and for such cases elaborate operations have been described in which the bladder has been opened from above the symphysis pubis and its mucosa plicated.

Urethral Caruncle

The typical urethral caruncle is a swelling about the size of a cherry stone, brilliant scarlet in colour with a smooth, glistening surface. Caruncles are always attached to the posterior part of the mucous membrane of the urethral meatus. The swellings are exquisitely tender and bleed easily; they cause local



FIG 80 A urethral caruncle

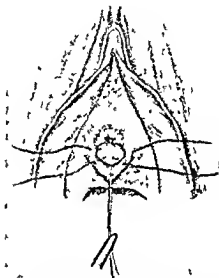


FIG 81 Operation for removal of a urethral caruncle. The lower suture, passed through the skin draws back the posterior edge of the meatus. The other sutures are inserted as shown, after which the caruncle is excised

tenderness and dyspareunia, and are responsible for extreme pain on micturition

In past years, urethral caruncles have not been clearly distinguished from localised prolapse of the urethral mucous membrane or from the granulations of the meatus which are so commonly found in patients past the age of the menopause and which are comparable to the red granulations found around the vaginal orifice in women of that age. In localised prolapse of the urethral mucous membrane the tenderness is not of the exquisite degree that is present with urethral caruncle nor is a pedunculated swelling produced. In women of post-menopausal age the red area

which develops around the meatus is usually restricted to the posterior part and forms a reddened prominence which is covered by a thin layer of epithelium. Such granulations are extremely common and cause no symptoms.

Urethral caruncles are covered by transitional epithelium with invaginations of the epithelium into the subjacent stroma. A common error is to mistake the histological appearances for those of a squamous celled carcinoma, for the transitional epithelium superficially resembles actively malignant squamous epithelium and the invaginations may be regarded as malignant infiltration of the stroma. Beneath the epithelium, the connective tissue core of the caruncle consists of connective tissues with a large number of dilated capillaries. In addition, there is always a well marked infiltration with plasma cells, together with an accumulation of lymphocytes. Pathologically a caruncle should be regarded as the representation of a chronic inflammatory process. Stoeckel has pointed out that the majority of urethral caruncles are seen in patients past the age of 50, but not uncommonly they develop in young women. Sometimes signs of past gonorrhœa can be found, while other cases are associated with persistent leucorrhœa.

The treatment of a urethral caruncle consists in excision. The operation may be extremely difficult to perform, for the caruncle is often friable, and there may be trouble in removing it completely. The patient must be anæsthetised and placed in the lithotomy position. Guiding sutures are first inserted through healthy tissue wide of the base of the caruncle and pulled apart. The caruncle, its base and a little of the surrounding healthy tissues are then excised. The wound is closed with interrupted sutures so placed that the scar comes to lie longitudinally. A transverse scar may cause, by its contraction, subsequent stenosis of the urethral meatus.

CHAPTER XI

THE PATHOLOGY OF CONCEPTION

CONCEPTION depends upon the fertilisation of the ovum by a spermatozoon. Much information has been obtained of the biological process whereby the spermatozoon enters the ovum, for fertilisation can easily be studied in lower animals. In the human subject, very little direct knowledge is available and many of the phenomena of reproduction are explained by comparison with what is known to happen in lower animals. Fertilisation is assumed to occur in the outer part of the Fallopian tube, for Corner has demonstrated that this is the usual site in the sow, and the incidence of ectopic gestation in the human subject proves that fertilisation can occur not only outside the uterus, but even outside the Fallopian tube.

The mechanism whereby spermatozoa pass along the uterus is not properly explained, for the ciliary movement of the uterine epithelium is downwards so that spermatozoa must migrate against the ciliary current. Similar difficulties are encountered when the migration of spermatozoa along the Fallopian tube has to be accounted for. Again, little is known of the survival period of spermatozoa in the female genital tract of human beings. In lower animals, conception is restricted to œstrus, whereas in the human female, although the œstrous phase of the menstrual cycle can be regarded as being restricted to a few days about half-way between two menstrual periods, there is strong clinical evidence that human fertility has far wider time limits than this. Siegel carried out an enquiry as to the relative fertility of the different phases of the menstrual cycle, and showed that the optimum phase was immediately after menstruation, while the least fertile phase was represented by the few days prior to the onset of menstruation. The problem has also been investigated by Knaus and by Ogino, who maintain that the optimum time is half way between the menstrual periods and agree that the least fertile phase is immediately prior to the onset of menstruation. These results probably hold true for the average woman, but with some

women fertilisation may seemingly take place at any phase of the menstrual cycle. It is possible that such cases can be explained by long survival periods either of spermatozoa or of the ovum itself in the female genital tract.

Little is known of the method of transport of the ovum from the ruptured follicle to the abdominal ostium. It is generally believed that ciliary movement induces currents which waft the ovum towards the abdominal ostium. Recent researches have shown that the fimbriae of the Fallopian tube, by muscular contraction, become spread out over the ovary at the time of ovulation, a movement which simplifies the transport of the discharged ovum into the lumen of the Fallopian tube. Furthermore, the musculature of the Fallopian tube undergoes *rhythmical contractions* at the time of ovulation and these contractions can be recorded by kymographic tracings. It is most likely that a form of peristaltic contraction of the Fallopian tube determines the transport of the ovum towards the cavity of the uterus. It is not easy, however, to understand how the fertilised ovum passes through the interstitial portion of the tube to reach the cavity of the uterus.

Disturbances of the sexual functions are much more frequent than is generally believed, and often cause great distress to both partners. It is a popular misconception to attribute sterility and difficulty during coitus to the female, but on general biological principles the distribution of the fault should be even between the two partners. It is not uncommon for patients to complain of difficulty during coitus when they have little knowledge of the correct method to be employed. During sexual intercourse the erectile tissues around the vaginal orifice become engorged and the vaginal orifice becomes more patulous. There is a discharge of mucus from the ducts of Bartholin's glands which acts as a lubricant. The female orgasm is induced by stimulation of the clitoris partly during the penetration of the penis and partly as the result of the clitoris being rhythmically pressed against the male after penetration. Little is known of the factors which constitute the female orgasm. It is believed that both the uterus and the Fallopian tubes undergo *rhythmical contraction*. There is some evidence that the mucous secretion contained in the cervical canal is extruded into the vagina during the orgasm. The seminal fluid is mainly deposited in the posterior fornix of the vagina, but it is possible that some of it is ejaculated directly into the cervical canal.

It is also believed that the contractions of the uterus and the Fallopian tubes during the female orgasm cause seminal fluid to be aspirated into the cavity of the uterus, and it is possible that this aspiration effect is responsible, in part at least, for the migration of spermatozoa upwards into the Fallopian tubes. The female orgasm is not essential for conception, and it is not uncommon to see women who have conceived without full consummation of the marriage and in whom the hymen is intact. In such cases the spermatozoa having been deposited around the hymen migrate through their own motility along the whole length of the vagina and uterus. On the other hand, it is not uncommon in cases of sterility to discover that the female partner has never experienced the orgasm of coitus.



Vaginismus

Vaginismus can be regarded as a hyperæsthesia which leads to spasm of the sphincter vaginae and the levator ani muscles during attempted coitus or when an effort is made to examine the patient vaginally. In typical cases, when the patient is being examined in the left lateral position and an effort is made to inspect the vulva by separating the labia, a muscle spasm is induced whereby the thighs are drawn together, the woman turns over on to her back, and by spasm of the muscles of her back assumes a state of mild opisthotonos. The levator muscles become tonically contracted, and commonly the patient cries out and endeavours to push the medical attendant away from her. A minor degree of spasm may be brought about by painful local lesions such as small infected lacerations of the hymen, urethral caruncles, vulvitis and kraurosis, and the spasm is not unlike that which develops in vaginismus, although it is never of the same degree.

Typical cases of vaginismus always have a psychological basis. Most frequently a history of mental trauma during adolescence can be traced, and in most women with vaginismus there is a subconscious dread of sexual intercourse. In typical cases no local abnormality is found at the vulva, and hindrances to coitus such as rigid hymen, though sometimes found are exceptional, and should be regarded as coincident. Even if the hymen is excised and the vagina made patulous by plastic operations, the vaginismus remains, and cases are recorded in which vaginismus has returned after childbirth. One of the commonest causes of

VAGINISMUS

vaginismus is difficulty or injury during defloration, particularly if methods of birth control have been employed. If efforts are made during the first coitus to prevent conception by the male using a condom, penetration and rupture of the hymen may fail. Local pain and tenderness may then result from bruising around the vaginal orifice and from small lacerations of the hymen. The lacerations may become infected and lead to subsequent tenderness and discharge, and the discharge may of itself eventually cause some degree of vulvitis. The pain caused by further attempts at coitus leads to a subconscious dread of sexual intercourse and forms the basis for subsequent vaginismus.

Most women who suffer from vaginismus are of the neurotic type, with their interests and attention constantly focussed upon their inability to consummate the marriage. Such women may complain of indefinite backaches, abdominal pain, headaches and irritability, and may acquire a highly neurotic disposition, particularly if repeated unsuccessful efforts are made to consummate marriage.



FIG 82 A glass vaginal dilator

The treatment of vaginismus is often exceptionally difficult, and much patience is required. The minor degrees of spasm which are induced by local lesions such as ulcerations of the hymen and urethral caruncles immediately respond if the local cause is cured. The psychical crises offer a much more difficult problem. Simple methods of treatment such as lubrication of the penis and hymen with ointments prior to coitus and slow dilatation of the vagina with glass dilators usually fail, and in due course the woman must be anaesthetised and the vaginal orifice rendered more patulous. Various operative methods are employed. The hymen may be excised, and the vaginal orifice digitally stretched. Plastic operations are also performed in which a longitudinal incision is made in the midline through the lower third of the posterior vaginal wall and skin of the perineum, when, after undercutting the tissues on each side and dividing the superficial muscles of the perineum, the wound is closed by interrupted sutures so that the scar lies transversely. The incision should be made of a length such that the vaginal orifice subsequently admits three fingers.

These operative measures are in most cases insufficient of themselves to cure the vaginismus, and it is almost always necessary for the patient subsequently to use glass vaginal

dilators The dilators serve not only to stretch the vagina, but they help to give the patient confidence, and in due course, when the largest size of dilator can be retained, the patient appreciates that there can be no difficulty in the penetration of the penis during coitus

Psychotherapy is often recommended for women suffering from vaginismus but experience shows that by the time the condition is well established psychotherapy is of little service

Dyspareunia

The term dyspareunia is used for cases of both difficult and painful coitus although it should be restricted to cases in which there is difficulty in the act

Difficult Coitus Difficult coitus may be caused by faults on the part of both partners In the male, the penis may very rarely be abnormally large or more frequently the erections are poor and ejaculation premature Premature ejaculation is a common complaint, and may occur before the penis has penetrated into the vagina

Difficulty may be experienced through abnormalities of the female, such as vaginismus rigid hymen and a small ill developed vagina Very rarely, tumours of the vulva congenital malformations, and such deformities as bony ankylosis of the hip in a position of adduction, may cause insuperable obstacles to coitus Such cases are important medico legally.

Painful Coitus Pain during coitus may depend upon local abnormalities of the vulva and infected lacerations of the hymen, vulvitis, Bartholinitis and urethral caruncle are frequent examples In kraurosis leucoplakia and growths of the vulva, the local tenderness may also prevent sexual intercourse Perineal scars resulting from tears during child birth or from perineorrhaphy operations may also be tender Vaginal abnormalities such as acute vaginitis and scarring of the paravaginal tissues also lead to pain

Tender swellings in the pouch of Douglas are amongst the most important causes of dyspareunia In retroflexion of the uterus if the ovaries are prolapsed into the pouch of Douglas, and are tender, ovarian pain may follow upon sexual intercourse. The ovaries may be tender through inflammation adhesions, sclerocystic disease or from the presence of chocolate cysts Ovaries of this kind are found to be extremely tender when they are palpated on bimanual examination, even when they are

normally situated with respect to the uterus and the simple palpation of such ovaries may cause distressing abdominal pain. Large tender ovaries are also found when coitus interruptus has been practised, and if such ovaries prolapse into the pouch of Douglas, extreme dyspareunia may be complained of. Other abnormalities of the pouch of Douglas such as pelvic endometriosis and diverticulitis indurations are also responsible for severe dyspareunia. The dyspareunia of such patients may be extremely severe, so that coitus becomes impossible and in consequence sterility may be produced.

Dyspareunia of this kind should be regarded as a symptom of the primary abnormality, and treatment consists in dealing with the cause. Local abnormalities at the vulva can usually be cured by appropriate treatment, but when dyspareunia is caused by such abnormalities in the pouch of Douglas as prolapsed tender ovaries, an abdominal operation is necessary. The ovaries may then be freed from adhesions, chocolate cysts can be excised and the uterus fixed in a position of anteflexion by a ventral suspension operation.

Sterility

The word sterility is nowadays employed for cases in which a woman is unable to give birth to a viable child. Various forms are recognised. In primary sterility conception has never taken place, while in secondary sterility a woman becomes sterile after having passed through one or more pregnancies. One child sterility is relatively common, and is usually caused by an ascending infection, during the puerperium to the Fallopian tubes so that their patency is lost.

Other terms used are "absolute" and "relative" sterility. In absolute sterility, through some fault of either the male or the female, fertilisation of the ovum is impossible. In the female such conditions as failure of the uterus or vagina to develop provide examples. In relative sterility, no obvious fault can be discovered in either partner, yet the woman remains sterile. Cases of women who repeatedly abort during pregnancy, and who never go to term are grouped together under the term 'infertility'. Other sterility cases have been classified under the terms temporary and permanent sterility, congenital and acquired sterility, artificial sterility and physiological sterility.

Physiological sterility is present before puberty and after the menopause. It must be remembered, however, that a girl

may conceive before menstruation develops, if the first ovum to be shed is fertilised. Similarly, after the menopause, it is possible that an ovum may be shed within the first few months following the cessation of menstruation and be fertilised, which if it had not been fertilised would have given rise to a menstrual period. The so called pre menstrual sterility is, at its best only relative, for as has already been pointed out, well authenticated cases are recorded when a woman has conceived when coitus has taken place immediately prior to menstruation.

A physiological sterility is present during pregnancy, for it is now established that ovulation is inhibited at this time. It is, however, possible that, during the first three months of pregnancy until the ovum fills the cavity of the uterus, superimpregnation may occur if aberrant ovulation develops. The explanation of superimpregnation requires the assumption that ovulation must take place during pregnancy, and it has been shown that aberrant ovulation of this kind is very exceptional.

The sterility of the lactation period should be regarded as relative. Only 60 per cent of lactating European women have amenorrhoea. The proportion is certainly higher amongst the Eastern races, and in China it is customary for women to nurse their children for two years, during which time they neither menstruate nor conceive. If a woman menstruates during lactation she is capable of conceiving, for menstruation is preceded by the discharge of an ovum from the ovaries. Conception is possible even in women who have amenorrhoea during lactation, and it has been found that conception occurred in 93 per cent of women with lactation amenorrhoea, the incidence being 18.6 per cent in women who were menstruating during lactation. If the first ovum to be discharged from the ovary during lactation is fertilised, the woman will conceive without menstruating. This explanation accounts for those cases of women who conceive during lactation.

Pathology of Sterility It has already been pointed out that conception depends upon the fertility of both the male and the female, and that it is a popular misconception always to attribute sterility to the female. In one third of all cases of sterility the male is directly responsible, in one third of cases he is the indirect cause, and in the remaining third only can the cause of sterility be attributed to the female. These figures are perhaps extreme, and it might be more accurate to distribute the fault evenly between the two partners.

Faults of the Male Gross abnormalities of the male such as maldevelopment of the penis may prevent the consummation of the marriage. In other cases the male may be impotent or the ejaculations premature, so that coitus cannot be performed normally. Again the male may be capable of coitus, but the ejaculations contain either no spermatozoa or spermatozoa which are pathological. In the condition azoospermia, live spermatozoa cannot be demonstrated in the seminal fluid. Azoospermia is usually caused by gonorrhœa when, as the result of gonocœcal epididymitis, the tubules become occluded by scar tissue. Azoospermia is sometimes present in diabetes, and develops after such diseases as typhoid fever, tuberculosis and syphilis. Such obstruction causes as chronic cystitis and prostatic hypertrophy also lead to failure of spermatozoa to be discharged in the seminal fluid, aspermia. Spermatozoa may be discharged without their normal motility, asthenozoospermia. This condition is seen in cryptorchism, in hypoplasia of the testis, in morphinism and after illnesses such as syphilis.

Other abnormalities of the seminal fluid are oligospermia, when only a small quantity of semen is discharged, and necrozoospermia, when spermatozoa are present in normal amount but are dead. The spermatozoa may be abnormal in shape, and a large number of pathological forms are known which can easily be detected if film preparations of the seminal fluids are stained and examined. The spermatozoa may be duplicated or the shape of the heads may be irregular, and all kinds of abnormalities have been described, teratozoospermia. In all cases of sterility the seminal fluid should be examined when, if any abnormality of the spermatozoa is detected, the cause of the sterility probably lies with the male.

Sterility can also be attributed to difficulty during coitus, Both parties may be at fault. The faults of the male have already been described. On the part of the female vaginismus and dyspareunia may prevent penetration. It should be remembered, however, that it is fairly common to see patients who are pregnant in whom the hymen is intact, so that there are no grounds for the popular belief that conception is impossible unless the act of sexual congress has been properly performed. Similarly it is not necessary for the female to have the orgasm of coitus before conception is possible.

Faults of the Female Congenital defects of the female may prevent spermatozoa from passing upwards to the Fallopian

tubes Examples are afforded by maldevelopment of the vagina, either of the type when the vagina is not canalised, or when it is occluded by a septum In extreme cases the vagina is not developed at all If the uterus fails to develop or if it is of the fetal type without canalisation, the woman must be sterile Such congenital defects of the Fallopian tube as failure to develop partial development and stenosis also lead to sterility

Sterility may be caused by less severe degrees of maldevelopment and ill development, such as rigid hymen, elongated conical cervix with a pinhole os, and acute antelexion of the uterus but in these conditions the customary hypoplasia genitalis may also be a factor in producing sterility

Retroflexion of the uterus is sometimes found in cases of primary sterility, and also in cases of repeated abortion In congenital retroflexion of the uterus when the retroflexion is acute with the uterus ill developed the patient is usually sterile Acquired retroflexion, such as is seen in prolapse and visceroprosis is not a common cause of sterility It is not easy to explain why retroflexion should lead to sterility unless it offers some hindrance to the migration of the ovum into the Fallopian tube However, it is a common clinical experience that sterility can be cured by suspending the uterus in a position of antelexion by operation after all other treatments have failed, so that it is reasonable to assume that retroflexion of itself may on occasion cause sterility

One of the commonest causes of sterility is salpingitis when, as the result of acute inflammation, adhesions form around the abdominal ostium while within the lumen of the tube the phlicæ become adherent and the passage way between the uterus and the abdominal cavity is blocked Gonorrhœa salpingitis following septic abortion and salpingitis following puerperal infection are the three common causes of sterility of this type Tuberculosis of the tubes also leads to sterility

Chronic inflammations of the endometrium of the body of the uterus are very rare, and should not be regarded as important in the ætiology of sterility Similarly, although chronic inflammations of the cervix might be expected to prevent the upward migration of spermatozoa it is exceptional to see cases when the sterility can be attributed to this cause

In recent years attention has been paid to chronic leucorrhœa as a cause of sterility There is some reason to believe that the

vaginal discharge in fluor vaginalis kills the spermatozoa, resulting in the woman's sterility. A high degree of acidity of the vaginal secretion also destroys the human spermatozoa. It is, however, exceptional to see cases in which the cause of the sterility can be attributed to abnormalities of the vaginal secretion. Inflammations of the vulva may indirectly lead to sterility because local tenderness may act as a bar to coitus.

It is well known clinically that if the uterus of a sterile woman contains a myoma and the myoma is removed the woman may subsequently conceive. Such cases are difficult to explain unless it is assumed that the myoma distorts or elongates the cavity of the uterus. The discharges from tumours such as carcinoma of the cervix and infected myomatous polypi kill spermatozoa. It has already been pointed out that dyspareunia is an important factor in the causation of sterility, and other factors on the part of the woman which lead to dyspareunia are retroflexion with prolapsed tender ovaries or inflamed appendages, pelvic endometriosis, together with local abnormalities at the vulva such as urethral caruncle, vulvitis and kraurosis.

In recent years attention has been paid to disturbances of ovarian function as being the cause of sterility. Women with pathological amenorrhoea due to ovarian hypoplasia are usually sterile and with less severe degrees of ovarian dysfunction, for example, when the woman has menstruated irregularly with a prolonged menstrual cycle, sterility is not uncommon. A comparable state of affairs exists after the creation of an artificial menopause with X rays or radium, and the production of a temporary artificial menopause has been employed in Germany as a method of birth control. Endocrine diseases, by inhibiting ovarian function, may lead to sterility, and a common clinical type is the woman aged about 30 with scanty and irregular periods, obese, with a masculine distribution of hair, who complains of sterility. Women with marbus cordis are exceptionally fertile, and it is a common belief that phthisical patients are apt to conceive easily, but with these exceptions chronic ill health and chronic disease reduce the fertility of the individual.

In recent years much attention has been drawn to hygienic factors which seem to influence human fertility. They are in many ways comparable to the measures taken to ensure prolific breeding in cattle. It is now well established in those cases of sterility when both partners have been found to be normal in spite of the exhaustive investigations of modern gynaecology,

that close attention to the habits and hygiene of both partners may result in conception. This is particularly so in the case of the male partner. Many men have insufficient sleep, work strenuously and anxiously for long hours and relax by the consumption of tobacco and alcohol. Often they overeat and exercise is taken in the form of violent physical exercise at spasmodic intervals. Clinical experience shows that adjustment of these factors is most important in the type of case referred to above. It is also well known that a husband's fertility is often improved by the ingestion of small doses of thyroid extract.

Many years ago Matthews Duncan investigated the fertility of women of different ages and showed that the maximum fertility was reached between the ages of 19 and 25. The fertility of young girls was shown to be small and the chances of a woman conceiving for the first time after the age of 40 are far less than in a woman between the ages of 20 and 25.

Clinical Investigation

Matthews Duncan's rule that a woman should not be regarded as sterile within four years of marriage should be taken as the basis for defining sterility. There is much confusion between sterility and fertility. A woman's fertility may be low, so that she conceives only with difficulty although capable of becoming pregnant. Such cases cannot be recognised unless a reasonable time is allowed to elapse from marriage.

Investigation of Sterility Cases. In most cases of sterility the woman presents herself for examination and investigation. A careful menstrual history should be taken, for scanty periods occurring at long intervals is suggestive of hypoplasia genitalis. Similarly, severe spasmodic dysmenorrhœa suggests either an ill developed uterus or a uterus which is acutely anteflexed. Previous labours and miscarriages should be enquired into, a history of puerperal fever or persistent lochial discharge or a history that the patient had to stay in bed for several weeks after parturition or abortion suggests the possibility of infection of the uterine adnexa. Again, it may be possible to obtain a history of symptoms suggestive of gonorrhœa such as acute vaginal discharge associated with scalding micturition, or of Bartholin's abscess. The Fallopian tubes may be bound down by adhesions as the result of past peritonitis caused, for example, by acute appendicitis or tuberculous peritonitis.

Enquiries should then be made as to whether difficulty has been experienced during coitus, and it is customary to ask whether this difficulty has been experienced during penetration or whether deep seated abdominal pain accompanies sexual intercourse. It is as well to enquire whether the patient experiences the feelings of the sexual orgasm during coitus. Many women attribute their sterility to *fluor seminis*, when the seminal fluid runs out of the vagina immediately after coitus.

Fluor seminis is extremely common, and is not of itself a cause of sterility.

Care should be taken to seek for evidence of endocrine disturbances. Adiposity, a masculine distribution of hair associated with frontal headaches and perhaps disturbances of vision are commonly found in such cases. Operation scars in the abdominal wall lead to questions being asked as to what operation was performed, if peritonitis had been present whether it was of a severe degree and whether a pelvic abscess had to be drained. The gynaecological examination will reveal such abnormalities as *vaginismus*, *vulvitis*, and abnormalities of the *vulva*, *rigid hymen* and *maldevelopment of the vagina*. A bimanual examination should then be made to determine whether the *cervix* is *small* and conical with a pinhole or whether the uterus is ill developed or *maldeveloped* and whether it is *acutely ante flexed* or *congenitally retro flexed*. Examination of the appendages should detect such conditions as *pyosalpinx* and *hydrosalpinx*, chocolate cysts or prolapsed ovaries in the pouch of Douglas.

It will be found possible after a simple examination of this kind to state whether there is a clear cause for the sterility on the part of the female, or whether no obvious local cause can be found. In the first group are such conditions as *vaginismus*, *maldevelopment of the vagina* and *bilateral salpingitis*. Similarly, if there is good evidence of disease of the endocrine system, the sterility can be attributed to ovarian dysfunction. In conditions such as *gross maldevelopment of the vagina* and *fixed uterus* the prognosis can be regarded as hopeless and there is no indication for further investigation or treatment. With *vaginismus*, *rigid hymen* and *retro flexion* associated with *prolapsed tender ovaries* the sterility may very well be cured by operative treatment.

It should be taken as a principle in the investigation and treatment of sterility to exclude any fault of the male before

undertaking any operative procedure or such investigation as insufflation of the Fallopian tubes on the female. It has already been strongly emphasised that the male partner is at fault in a large number of cases of sterility, and there is no justification for subjecting a woman to operation which, though not greatly inconveniencing her, will not be followed by conception because the male partner is unable to procreate.

The next step in the investigation of the case is the examination of the husband. Although the importance of the investigation of the male partner has been strongly stated for many years it is surprisingly common for this examination to be neglected. Practitioners are apt to content themselves with an examination of the external genitalia of the male and to ask a few questions as to his ability to consummate the marriage. Such an examination is insufficient and it is necessary to examine the semen microscopically before it can be stated definitely that the fault does not lie with the male partner.

The husband should be asked to supply a specimen of seminal fluid for examination. If collected in a condom it is preferable for a fish skin sheath to be used. In any case the end of the sheath should be cut with scissors and the seminal fluid immediately transferred to a small glass jar or bottle which has been thoroughly washed in running water and carefully dried. The specimen should be examined within two hours after coitus. Clinical pathologists maintain that masturbation specimens are equally suitable for examination. The average volume of seminal fluid is between 3 and 4 c.c. Less than 1.5 c.c. is abnormal. The pH is 7.8 so that seminal fluid is slightly alkaline. Normal semen contains glucose, lactic acid phosphates and calcium. The sperm population is normally about 100,000,000 per c.c. The seminal fluid is examined microscopically in the form of a hanging drop preparation and the motility of the spermatozoa recorded. The sperm population is calculated with the use of a haemocytometer. The shape of the spermatozoa is determined by examination of stained films. Much work has been done in the last few years on the examination of the seminal fluid. It has become established that variations from the normal are fairly common. In this way many cases of subfertility of the male can be explained and there is reason to believe that some cases of miscarriage are primarily due to fertilisation of the ovum by an abnormal spermatozoon. It is suggested therefore that if a woman gives a history of

STERILITY

repeated miscarriages, the seminal fluid of the husband should be examined in the laboratory

If the seminal fluid is found to be abnormal, the husband will require treatment. Preferably, he should be referred to a genito urinary surgeon who is equipped with a full knowledge of male endocrinology. There is some evidence—though slender—that improvement may follow upon the administration of gonadotropic hormones. Moreover, impotence and subnormal virility may respond to treatment with testosterone.

A distinction must be drawn between the treatment for sterility and the treatment of vaginismus, rigid hymen and dyspareunia. The latter conditions should always be treated to allow the marriage to be consummated so long as the husband is capable of performing the act of sexual intercourse.

Huhner's method of post coital examination consists in examining mucus from the cervical canal for spermatozoa within one hour of coitus. The examination is simple to carry out and gives the information as to whether spermatozoa migrate into the cervical canal. In normal cases, spermatozoa should maintain their motility for five hours. The work of Seguy and Vimeux should be mentioned. They have shown that the amount of cervical secretion is increased at the time of ovulation and have emphasised the importance of cervical secretion in protecting spermatozoa from the acidity of the vaginal contents. The seminal fluid is slightly alkaline with a pH of 7.8. During the orgasm of coitus, cervical mucus is discharged into the vagina and affords an environment which is not antagonistic to the viability of spermatozoa. In addition, the cervical mucus has a chemiotactic influence on spermatozoa which enables them to penetrate through the cervical plug to reach the cavity of the uterus. The evidence available at present suggests that the secretion and properties of the cervical mucus depend upon the oestrogen content of the blood.

At the present day, it is customary to carry out other investigations on the patient before subjecting her to operative treatment. It is important to determine whether the secretory phase of the endometrium is normal, for this is direct evidence as to the occurrence of ovulation and the formation of a corpus luteum. One method is to determine the excretion of pregnandiol in the urine. The biochemical technique is fairly simple and the test should be employed more frequently than is the present-day practice. The second method is to employ endometrial biopsy

Anæsthesia is unnecessary and the patient is placed in the lithotomy position and the cervix exposed with retractors. It is pulled down with Voisellum forceps and cleaned with an antiseptic. It may be necessary to dilate the cervical canal slightly with Hegar's dilators after which a cannular curette is introduced and shreds of the endometrium scraped away. The material removed is examined microscopically in the usual way. If there is well marked secretory activity of the endometrium the evidence is conclusive that the luteal functions of the ovaries are good. Unfortunately, the correct interpretation of the appearance of the endometrium is not always easy. Sometimes only the superficial layer of the endometrium is removed, when the identification of secretory changes may be impossible. The case may then be regarded as one of anovular menstruation. The method has shown that anovular menstruation in the human subject in patients with regular menstrual cycles is an extreme rarity.

There is no reliable method of determining the oestrogenic activity of the patient for the concentration of oestrone in the urine is difficult to determine. The recent method of Mack whereby the glycogen content of the vaginal epithelium is determined may prove of great value. The vaginal epithelium is collected by means of a cotton wool smear and transferred to a glass slide. A film is stained by exposure to the vapour of Lugol's solution. It is possible to grade the oestrogenic activity of the patient moderately accurately by this method.

The determination of the gonadotropic activity is also unreliable in the non pregnant woman.

INSUFFLATION OF FALLOPIAN TUBES

The next step in the investigation of the case is to determine whether the Fallopian tubes are patent.

Utero salpingography

With the lipiodol technique due to Forsdike no anæsthetic is required. The patient is placed in the lithotomy position and the cervix exposed with retractors and pulled down with Voisellum forceps. The cervix is cleaned with ether and picro acid solution and slowly dilated with Hegar's dilators until a metal cannula can be introduced into the body of the uterus.

The cannula is kept in position by the attachment of a large pair of volsellum forceps to both lips of the cervix, one limb



FIG. 83. Hegar's dilator.

being fixed in front and the other posteriorly, so that when the forceps are closed the cannula is retained in the uterus. The patient is now taken to an X-rays table and 10 c.c. of lipiodol



FIG. 84. Lipiodol insufflation of the tubes. Photograph taken immediately. The lipiodol has permeated along both Fallopian tubes. The ampullary regions, being the most distensible, retain more lipiodol than the isthmus.

are slowly injected into the cannula. A photograph is taken immediately and if necessary further photographs are taken on the next day. If the Fallopian tubes are patent, the lipiodol permeates the Fallopian tubes, while photographs taken on the

following day will show the lipiodol lying in the peritoneal cavity. If the Fallopian tubes are stenosed, the lipiodol does not pass into them, while in cases of hydrosalpinx and of adhesions around the abdominal ostium the Fallopian tubes become distended with lipiodol, but none passes into the peritoneal cavity. It is a mistake ever to assume that the Fallopian tubes are occluded if the lipiodol test is negative. Experience shows that in these cases the lipiodol test must be repeated before the diagnosis of occlusion of the Fallopian tubes can reasonably be made, for there is an obvious possibility that the lipiodol may not always be injected into the Fallopian tubes but may run out alongside the cannula into the vagina. The lipiodol test is simple to carry out, requiring no anæsthesia and, when the lipiodol passes along the whole length of the Fallopian tubes gives convincing proof of patency. Sometimes however, patients suffer from faintness and shock during the test and it is always as well to give a preliminary injection of morphia before dilating the cervix. It is a common clinical experience that a large number of patients conceive shortly after the lipiodol injection has been made, and such cases are explained by assuming that the lipiodol breaks down adhesions either in the tube itself or around the abdominal ostium. It is most likely, however, that the instrumental dilatation of the cervix is the cause of the good result.

GAS INSUFFLATION

The method of insufflating the Fallopian tubes with gases has been used extensively by Rubin, Von Graf and others, and consists in passing either air or carbon dioxide under pressure into a uterine catheter, the gas pressure being recorded by a manometer. Many different forms of apparatus are employed at the present day, but the principle of them all is the same. If the Fallopian tubes are patent the gas passes through into the peritoneal cavity at a pressure of about 60 mm. of mercury. If the Fallopian tubes are blocked, the manometer pressure is raised much higher than this, but it should never be allowed to exceed 200 mm. of mercury, otherwise damage may be done. The gas can be heard bubbling through into the peritoneal cavity when a stethoscope is placed over the lower abdomen. The usual technique for insufflation is to give the patient an anæsthetic, place her in the lithotomy position and dilate the

cervix up to about number 3 Hegar. A uterine cannula is then inserted and the vagina filled with sterile saline. The pressure in the apparatus is raised to about 100 mm. of mercury and the gas allowed to pass into the cannula. If the tubes are patent the manometer pressure gradually falls and gas does not bubble through the water which has been placed in the vagina. If, on the other hand, the Fallopian tubes are occluded, the manometer pressure remains stationary even if raised to the 200 mm. level.



FIG. 85. Lipiodol insufflation. Photograph twenty-four hours after the test illustrating lipiodol and the peritoneal cavity.

After the insufflation test has been made, the cervix should be further dilated with Hegar's dilators up to about number 14 Hegar, and a glass rod may be left in the cervical canal for two days. Just as with the lipiodol test, negative findings should not be regarded as convincing proof of occlusion of the tubes, unless the test is repeated. If the Fallopian tubes have been found to be patent, and if the husband has been proved to be capable of producing normal spermatozoa, no further operative treatment is possible. It has already been pointed out that

patients conceive after the tests have been made, probably on account of simple dilatation of the cervix

The simple insufflation technique described above has been replaced by the kymographic insufflation in which pressures are recorded on a revolving drum

The apparatus which is used at the present day is that devised by Bonnet. It is advocated that the test should be carried out at the approximate time of ovulation, for it is established that the muscle of the Fallopian tube is more sensitive at that time and by its intermittent contractions, produces characteristic markings on the revolving drum. If the Fallopian tubes have

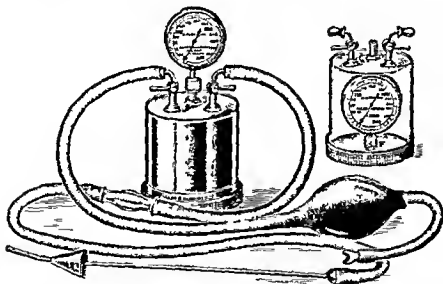


FIG. 80. Apparatus for insufflation of Fallopian tubes

normal patency gas passes at a pressure of about 100 mm of mercury. If however, the Fallopian tubes are *occluded*, the pressure rises to above 200 mm of mercury. In practice, the pressure is maintained at the level of 200 mm of mercury for about a minute, when the tracings will show a characteristic appearance. Sometimes there is a *spasm* of the Fallopian tube which requires a fairly high pressure to overcome it, after which, the gas passes through at a normal pressure of about 100 mm of mercury or less. If there is a *stenosis* of the Fallopian tubes, the tracings show that the pressure must first be raised to well above 100 mm of mercury, after which the pressure falls steadily

In tubal stenosis, contractions are never recorded and a similar kymographic tracing is obtained whenever the test is repeated. It is important to emphasise the therapeutic value of all methods of determining tubal patency, for it is well known clinically that many patients conceive fairly soon after the tests have been employed. Presumably, minor occlusions in the path between the external os and the abdominal ostium are overcome. If the tests for tubal patency show that the Fallopian tubes are stenosed or occluded, operative treatment to fashion an artificial abdominal ostium by the operation of salpingostomy may be advised. The operations which are performed for cases of sterility will now be described.

An obvious fault of the female may be present. For example, the hymen may be rigid and prevent penetration. Although conception is possible in such cases, the chances are small and the obvious procedure is to excise the hymen and to make the vagina patulous. If the uterus is ill developed, with the cervix long and conical and the external os small, the correct treatment is to dilate the cervix slowly under anaesthesia and at the same time to insufflate the Fallopian tubes. In congenital reflexion of the uterus associated with sterility, the uterus may be replaced in its normal position of antelexion by a ventri suspension operation. It is best in such cases to perform preliminary dilatation of the cervix before proceeding to the abdominal operation, for the cervical canal is frequently small in cases of this kind. If a myoma is present, treatment consists in myomectomy by the abdominal route and care must be taken to ensure that the interstitial portion of the Fallopian tube is not damaged during the operation. With chocolate cysts and pelvic endometriosis abdominal operation is necessary, when the uterus should be ventri suspended, adhesions around the Fallopian tube broken down, and the chocolate cyst resected from the healthy ovarian tissue. In salpingitis the prognosis as regards subsequent pregnancy is bad. If each Fallopian tube is replaced either by a pyosalpinx or a hydrosalpinx the prognosis is hopeless. If, on the other hand, the Fallopian tubes are bound down by adhesions and if the abdominal ostium is closed, it may be possible to fashion an artificial abdominal ostium by the operation of salpingostomy.

Utero salpingography is first employed to determine the site of occlusion in the Fallopian tubes and prior to operation, the operator should know the exact position of the obstruction.

In some cases, light adhesions surround the abdominal ostium. These can be easily broken down with the fingers, but it is important to ensure complete hæmostasis before the abdomen is closed, otherwise fresh adhesions will form later. The patency of the rest of the Fallopian tube can be determined quite easily by syringing sterile saline with a 10 c.c. syringe—not fitted with a needle—through the abdominal ostium. If there is a congenital stenosis or stenosis from adhesions half way along the tube, obviously the salpingostomy opening must be made on the uterine side of the stenosis. If there is occlusion of the interstitial portion of the tube, determined by utero salpingography, the isthmus end of the tube can be detached from the uterus and implanted into the cavity of the uterus after incising the myometrium and exposing the cavity of the uterus. The technical difficulties of salpingostomy are very great, but successes are obtained from time to time. Great skill is required to perform plastic operations on the Fallopian tube and one of the first essentials is to ensure complete hæmostasis, otherwise fresh adhesions will form and the artificial abdominal ostium become blocked.

In recent years attention has been paid to the endocrine disorders which may form the basis for sterility. It has been shown that the male partner often shows signs of hypothyroidism when he should be treated with small doses of thyroid. There is also reason to believe that overfatigue is another factor and it is well known that conception often ensues upon a long holiday at the seaside.

If the virility of the husband is sub normal, he should be treated with testosterone in doses of about 25 mgm. three times a week. The gonadotropic hormones are also used in some cases of male infertility with doubtful results.

In the case of the female partner good results follow upon the administration of œstrin in those cases in which there are clear signs of ovarian insufficiency (see Chap. XVI, p. 355). The dose of œstrin necessary depends upon the particular type of case (see p. 355), and it is of course, important to select suitable patients for the therapy. It is unscientific to inject œstrin into all women who are sterile and much cannot be hoped if the treatment is used for polyglandular disturbances. Another method of attack consists in the use of wheat germ oil on the hypothesis of a deficiency of Vitamin E. The treatment is empirical for there is usually no suggestion of such insufficiency,

but good results have been claimed. The preparation should be given to both partners.

Artificial Insemination

The value of artificial insemination has been stressed in recent publications. The technique is surprisingly simple. The seminal fluid is collected in a condom and transferred immediately into a sterile dry glass jar. It is established that the earlier the specimen is injected after emission the more likely is the treatment to be successful. Sometimes a masturbation specimen may be preferred because it can be obtained without the risk of infection. Other gynaecologists prefer to inject seminal fluid deposited in the vagina during coitus. The simplest method of injecting the seminal fluid is to use a 10 c.c. syringe to which a Eustachian catheter is attached. The cervix is exposed and disinfected with an antiseptic. The sterile syringe is filled with the seminal fluid and the Eustachian catheter introduced through the cervical canal above the internal os and the seminal fluid injected directly into the cavity of the uterus. If the patient is apprehensive, she can be treated by a preliminary dose of a sedative mixture.

Repeated Abortions

It is not uncommon to see patients who have no difficulty in conceiving yet who repeatedly abort in the early months of pregnancy. The etiology is often indefinite but well recognised causes are now established. In syphilis, miscarriage hardly ever occurs before the 20th week of pregnancy and the typical history given by syphilitic patients is that succeeding miscarriages occur later in pregnancy, until finally the woman goes to term and is delivered of a stillborn syphilitic child. The Wassermann reaction will establish the diagnosis, and with appropriate antisyphilitic treatment the woman may deliver herself of a healthy non syphilitic child at term.

The majority of repeated miscarriages in the early months of pregnancy are caused by ill development of the uterus. The history given by such patients is that they miscarry about the second or third month of pregnancy and then after two or three miscarriages the succeeding pregnancy proceeds normally to term. It is very rare for ill development of the uterus alone to cause more than three miscarriages of this kind.

If a woman miscarries repeatedly more than four times, it can safely be assumed that in addition to ill development of the uterus, some other factor, such as a disturbance of the endocrine system, is contributory. When ill development of the uterus is the cause of repeated miscarriages, a history can usually be obtained of a late onset of puberty, irregular and scanty menstruation which is frequently associated with dysmenorrhœa, and when the uterus is examined in the non pregnant state, it is found to be small and ill developed. A good prognosis can be given for cases of this kind. Treatment should consist in simple dilatation of the cervix and of curettage about three months after a miscarriage has occurred.

Retroflexion of the uterus is another cause of repeated miscarriage and should be treated by ventri-suspension, but prior to the abdominal operation a preliminary dilatation and curettage should be performed as the uterus is often ill developed in such cases. Myoma of the uterus may also cause repeated miscarriages, and if no other local abnormality can be found, the myoma should be removed by myomectomy.

Repeated miscarriages often follow upon a difficult delivery at term if the cervix has been badly torn and particularly if the lower segment of the uterus has been lacerated. Although the prognosis is bad in such cases, treatment should consist in repairing the cervix by operation.

Rare causes of repeated miscarriages are split pelvis and spina bifida occulta. Sometimes women miscarry repeatedly after Cæsarian section when it is found that the silk worm gut sutures used in the operation project into the cavity of the uterus. They can be removed either by curetting with a sharp curette or with a button hook. In many cases, no explanation of the repeated miscarriages can be offered from the clinical examination and investigation. It should be remembered that Mall demonstrated that the embryos of many cases of abortion are malformed, and there is some evidence that the husband may sometimes be at fault when no obvious explanation is available. The husband's spermatozoa should therefore be examined microscopically before any operative interference is undertaken on the female. It is also established that dysfunctions of the endocrine system are responsible for some cases of repeated miscarriages, and in selected cases the administration of the sex hormones gives excellent results. Care must be taken to distinguish the various types of case, for it is harmful to

administer any of these hormones if they are already being produced in excess. There is reason to believe that over-activity of the corpus luteum, by producing extreme proliferation and hyperæmia of the endometrium of the uterus, is sometimes a factor in causing abortion. Such cases can be recognised only by preliminary curettage during the secretory phase of the menstrual cycle and by examining the endometrium microscopically. If the secretory changes are abnormally developed the administration of the anterior pituitary sex hormone or of progesterin during a subsequent pregnancy is contra indicated. If, on the other hand, the secretory hypertrophy is poorly developed then treatment with progesterin may lead to good results (see Chap. XVI, p. 354).

The general treatment in cases of repeated miscarriage is of importance. Patients should be kept in bed at the times corresponding to the suppressed periods, and if vaginal bleeding or uterine contractions develop during the pregnancy the patient should be put to bed and treated with soporifics.



BIRTH CONTROL

Birth control is looming more and more prominently in the economic and social problems of to day, and it is necessary for medical men to have clear cut ideas of the medical indications for its practice, together with a fairly comprehensive knowledge of the different methods in common use. The attitude of the Catholic Church towards birth control should be familiar to all medical men. Next, medical men should realise that the problem is one of relativity, for women vary in their fertility and it is not always realised that methods which are reliable with some women fail completely with others.

It is important to realise that birth control has two aspects, one sociological, the other medical. A professional medical man's opinions on the sociological aspects are those of an individual and should not be put forward except as such.

It is well established that pregnancy aggravates certain medical diseases, so that a woman's life may be endangered if she becomes pregnant. Amongst these diseases are severe degrees of mitral stenosis, chronic nephritis, active pulmonary tuberculosis, the insanity of pregnancy and the puerperium, chorea gravidarum and some blood diseases. In such cases it is a common practice to terminate the pregnancy by abdominal

hysterotomy and at the same time to sterilise the patient by excising wedges from the Fallopian tubes, or if the patient has already progressed in pregnancy until she is near term to perform Caesarian section and sterilisation. It is only rarely that the question of sterilisation crops up except when the patient is pregnant. Whenever the operation of sterilisation is to be performed, care must be taken to explain to both husband and wife exactly what procedure is going to be adopted and the consent of both parties must be obtained in writing before the operation is undertaken.

If patients with diseases of this kind approach a medical man as to the advisability of conceiving, the practitioner is justified in advising against conception and he should instruct the patients as to which method of birth control should be followed.

Practitioners are frequently asked to instruct patients in methods of birth control. Unless there are medical contra-indications to pregnancy, the practitioner should indicate to the patient, not only the method he recommends, but also the harmful effects birth control may have upon the woman. The lay public has received a great deal of gratuitous propaganda on birth control, but they have not been properly instructed of its after effects. For example, it is well known clinically that myomata of the uterus, chocolate cysts of the ovary and pelvic endometriosis usually arise in patients who have never been pregnant or who have had only one pregnancy after many years of married life. The woman who practises birth control is therefore more likely to develop these complications than a woman who has a large family. On the other hand, a woman who does not conceive is less likely to develop carcinoma of the cervix than a multipara. Again, women who practise birth control frequently develop ovarian pain with its attendant neurotic symptoms. Further, in such conditions as spasmodic dysmenorrhoea and sclerocystic ovaries pregnancy should be regarded as the physiological cure.

The methods of birth control which are practised are as follows —

COITUS INTERRUPTUS

This method is used very widely, the husband withdrawing his penis immediately before ejaculation. The method is unreliable in a certain number of cases, because a little fluid may be unconsciously discharged from the meatus before

ejaculation and if the fluid contains spermatozoa, the sperms may cause conception. The method clearly depends upon the self control of the husband. Also, the maximum happiness of sexual congress cannot possibly be achieved. Furthermore, if the woman is anxious not to conceive and has a dread of conception, she may quite easily develop an anxiety neurosis until her next period appears. The harmful psychological effect on such women is well recognised. There is also clinical evidence that the practice of coitus interruptus is followed by the development of pelvic pain and in some cases the ovaries become tender.

The Condom This is the most reliable of all methods of birth control. A rubber sheath is placed over the penis, lubricated with vaseline, and collects the seminal fluid which is ejaculated.

The condom should be of good manufacture and should be obtained from a reputable firm, otherwise it may burst. The popular objection to the method is that both partners particularly the male, do not obtain the full happiness of sexual congress because of the intervention of the sheath.

Check Pessaries Two main types of check pessaries are used. The better of the two types is the Dutch cap, which consists of a rubber cap of the shape of a porcelain crucible which is attached to a rigid ring. The pessary is placed so that the rigid ring accurately fits the vaginal fornices and the rubber diaphragm prevents spermatozoa from passing into the cervical canal. It is customary for the rim of the Dutch cap to be covered with an ointment containing quinine or some spermicidal chemical. The other type of check pessary is of somewhat similar shape as the Dutch cap but is fitted to the cervix itself. With both methods it is important that the correct size of pessary should be fitted to the patient and that she should be instructed how to introduce and fit the pessary herself. It is customary for patients to douche themselves either immediately after coitus or on the following morning. It is a mistake, however, for the patient to remove the pessary until at least twelve hours have elapsed.

Clinical experience shows that check pessaries, however carefully fitted, are not always reliable. It is possible that the patient does not always adjust the pessary correctly but if the fertility of either partner is high any sperm which contrives to pass the rim of the cap in due course may reach the cavity of the

uterus and the Fallopian tube. For this reason it is best to advise the combination of a check pessary with some form of chemical pessary, preferably one of the foaming type.

Gold Pin In this method a pin which consists of two spring arms, fixed to a perforated gold disc, is introduced into the cavity of the uterus, the disc lying in contact with the external os. After introduction the pin remains *in situ* and need not be removed for many months. This method is universally condemned because the pin leads to chronic infection of the body of the uterus and cervix.

Gräfenberg Ring The Gräfenberg ring is still used extensively at the present day. The ring is made of a soft circular spring of non-corrodable metal which is introduced into the body of the uterus after preliminary dilatation of the cervix. The ring is usually retained in the uterus for six months when it is removed with a special instrument and a new ring introduced. The Gräfenberg ring produces a low grade endometritis which acts as a bar to implantation and probably kills spermatozoa as they migrate upwards towards the Fallopian tubes. The method is fairly reliable but cases are recorded from time to time when conception has occurred in spite of the presence of a Gräfenberg ring in the uterus.

Pessaries Many forms of soluble pessaries are introduced into the vagina prior to coitus as methods of birth control. Quinine pessaries are used extensively and usually consist of quinine sulphate mixed either with gelatine or cocoa butter. The pessaries dissolve in the vagina and liberate the quinine which has a spermicidal action. Some time should elapse between the introduction of the pessary and the act of sexual intercourse. Other pessaries are of the foaming type, which liberate carbon dioxide after being introduced into the vagina, and the discharge of gas distributes the spermicidal chemical over the vagina and cervix.

Sponges and Tampons Small sponges or tampons impregnated with a solution of quinine sulphate are sometimes introduced into the top of the vagina. The method is fairly reliable, but if the sponge is large it may impede penetration.

Douches Douching immediately after coitus with a solution containing a spermicidal chemical is an extremely unreliable method.

The Safe Period There is much confusion as to the relative fertility of the different phases of the menstrual cycle. If it is

accepted that ovulation is restricted to about the fourteenth day and if spermatozoa have short survival periods in the female genital tract, it is reasonable to assume that the most fertile phase is between the twelfth and sixteenth days. Knaus and Ogino have both insisted that conception is only possible if coitus takes place midway between two menstrual periods. The most fertile phase of the menstrual cycle is certainly that around the fourteenth day, but it is equally certain that coitus may be fertile at other times during the menstrual cycle. The least fertile phase is probably the few days prior to the onset of menstruation, and similarly it is rare for women to conceive if they have cohabited during the first few days after menstruation.

It has already been emphasised that a woman's fertility is difficult to assess, nor do we know all the factors which control fertility. Evidence is accumulating that a woman with a high degree of fertility may conceive if she is impregnated at any stage of the menstrual cycle except during menstruation itself. On the other hand, in women of low fertility, if coitus is restricted to the times immediately after and immediately before menstruation, conception is unlikely. The restriction of sexual intercourse to these so called safe times is an unreliable method of birth control because a woman's fertility is usually indeterminate. Also, there is reason to believe that a woman's fertility is variable, so that the method which has previously proved safe may fail as the result of a sudden outburst of fertility.

Medical men are often asked which method of birth control they consider the most reliable. The question is difficult to answer because women vary in their fertility. If a woman's fertility is low a simple method of birth control such as the introduction of a quinine pessary may be sufficient to prevent conception. On the other hand, if the fertility is exceptionally high, the woman may conceive, even if such methods as the use of a Dutch cap or a Grafenberg ring have been adopted. A medical man is often unable to assess the degree of fertility of his patient, and he may suggest a method which is insufficient if the woman's fertility is high. The most reliable method is the condom, but it is important that the condom should be obtained from a reputable firm, otherwise the rubber may be perished. It will be found in practice that objections are very often raised against the use of a condom both by the husband and by the wife. It is axiomatic that any mechanical interference with the act of sexual congress must be paid for, usually

by depriving one or other partner of the full pleasure of the act. A common practice is for a foaming pessary to be introduced into the vagina prior to the act of sexual congress and subsequently, shortly before ejaculation, the husband uses a condom. Next in order of reliability is an accurately fitting Dutch cap, but this should always be combined with the use of a pessary of the foaming type. The general health of people who practise coitus interruptus, particularly the female partner, is probably affected adversely, not because of deprivation of hypothetical hormones but because of anxieties and tender ovaries.

Objections have been made to the use of condoms and coitus interruptus, because it has been claimed that after physiological coitus the seminal fluid is absorbed from the vagina and the general health of the woman is thereby improved from the addition of hypothetical hormones to her circulation. Fluor seminis is, however, extremely frequent in women who are happily married and in perfect health, and there is little evidence that the absorption of seminal fluid from the vagina has the effect which has been claimed.

CHAPTER XII

PATHOLOGY OF PREGNANCY

ABORTION

ABORTION refers to the termination of pregnancy prior to the 28th week, for the child is not viable until that stage of pregnancy is reached. If pregnancy terminates between the 28th week and the 40th week, the term premature labour is employed. The word miscarriage is widely used, perhaps because the lay public are apt to regard abortion as representing a criminal procedure. The present day tendency is to use the words abortion and miscarriage synonymously.

The incidence of abortion is far higher than is generally believed. Accurate statistics are impossible to obtain, but it is probable that at least one of every five pregnancies terminates in abortion. In view of the large number of cases of abortion that are seen, many causes are recognised.

ÆTIOLOGY

f Abnormalities of the Fœtus

(1) *Maldevelopment* It has been shown by Mall, that approximately 50 per cent. of abortion material of the first two months of pregnancy show errors of development of the fœtus. If abortion specimens are carefully examined, such abnormalities as anencephaly are fairly commonly found, less extreme degrees can only be recognised by histological examination of the fœtus.

(2) *Infections* It is established that the fœtus may be infected from the maternal blood stream in typhoid and paratyphoid fevers, pneumonia, syphilis, smallpox, malaria and measles. It is extremely rare for tubercle bacilli to pass through the placenta into the foetal circulation, although such cases are occasionally recorded.

(3) *Poisons* There is reason to believe that certain poisons which are administered to the mother pass into the foetal circulation.

and cause the death of the embryo. Amongst these are mercury, phosphorus and carbon monoxide gas. It is also established that the diphtheria toxin passes into the foetal circulation, just as such immunising bodies as tetanus antitoxin, diphtheria antitoxin and hæmolytins also reach the foetal circulation when administered to the mother.

Radiological Effects If large doses of X rays are administered to the abdomen of a pregnant woman there is a tendency to abortion, because the foetus may be killed by the X rays. Similarly, pregnancy may terminate as the result of irradiation of the ovaries during pregnancy. There is also good evidence that smaller doses of X rays may lead to the birth of a maldeveloped infant, and if X rays treatment either to the uterus or ovaries has been employed prior to the pregnancy, the foetus born of a subsequent pregnancy may be maldeveloped.



Abnormalities of the Secundæ

Abnormalities of the umbilical cord, such as knots of the cord and short cord, must be regarded as very rare causes of abortion. Acute hydramnios sometimes causes abortion, while diseases of the chorion, such as hydatidiform mole and abnormalities such as placenta prævia, also lead to abortion. Placenta prævia probably causes abortion more frequently than is generally believed.

Diseases of the Mother

Local Abnormalities of the Genitalia *Ill Development of the Uterus* One of the commonest causes of abortion is ill development of the uterus. If the uterus is of the foetal type, conception is impossible, but with the infantile uterus there is a well marked tendency to abortion in the first three months of pregnancy, probably because the myometrium of the uterus is not sufficiently developed to contain a pregnancy greater in size than this. The common history in such cases is that the woman aborts two or three times, and then, because the myometrium has become hypertrophied by these previous pregnancies, the pregnancy subsequently goes to term.

Maldevelopment of the Uterus With all types of maldevelopment of the uterus there is a well marked tendency to abortion in the early months of pregnancy, although it must be remembered that such malformations of the uterus do not necessarily lead to abortion, and in the case of uterus didelphys a normal

pregnancy may develop in one cornu without complication during labour. With all malformations of the uterus, however, the tendency to abortion is higher than when the uterus is normally developed.

Displacements of the Uterus Retroflexion of the uterus, particularly when it is of the congenital type, is a frequent cause of abortion, when the pregnancy usually terminates during the second or third month. The uterus rises out of the pelvis during the fourth month, so that abortion cannot be attributed to retroflexion after that time.

Acute Antelexions of the Uterus The so called cochleate uterus, when the uterus is acutely antelexed, frequently leads to abortion in the early months of pregnancy.

Prolapse If there is an extreme degree of prolapse of the uterus during pregnancy, there is an increased tendency to abortion.

Injuries An important cause of habitual abortion is severe laceration of the cervix and lower segment of the uterus caused by a previous difficult delivery. Similarly, repeated abortion may ensue upon amputation of the cervix. Repeated abortion may occur after Cæsarian section, probably because the ovum becomes implanted in the region of the scar.



General Diseases of the Mother

Generalised Acute Infections In measles, scarlet fever, cholera, typhoid, diphtheria, smallpox and malaria, there is a well marked tendency for the pregnancy to terminate in abortion or premature labour. In typhoid fever there is evidence that the bacilli pass into the foetal circulation and cause the death of the foetus, while in diphtheria there is reason to believe that the diphtheria toxin is responsible for the death of the foetus. With the other specific fevers, the cause of the abortion is not known. It is well established that severe degrees of pyrexia always tend to be followed by abortion, and it may be that the high temperature of such specific fevers as smallpox and measles is the cause of the abortion rather than that the virus of the disease permeates into the foetal circulation.

Localised Acute Infections of the Mother In pneumonia and erysipelas there is the same tendency to abortion, and with pneumonia it is not uncommon for pneumococcal peritonitis to develop subsequent to the evacuation of the uterus.

Chronic Infections *Syphilis* Syphilis was formerly believed

to be an important cause of abortion in the early weeks of pregnancy. The work of Weber and others has established that syphilis very rarely, if ever, causes abortion before the 16th week. On the other hand, syphilis is an important factor in the termination of pregnancy after the 24th week.

Tuberculosis Tuberculosis is not a common cause of abortion, and cases are seen only if the infection is widespread and progressive.

Chronic Medical Diseases In diabetes, approximately one third of all pregnancies terminate in abortion. It should be remembered, however, that women suffering from diabetes are usually sterile, and according to Seitz, only 5 per cent of diabetic patients of the child bearing period of life conceive. Since the introduction of insulin, the position has changed, and the incidence of abortion in women suffering from diabetes who are under insulin treatment is far less than previously. Nevertheless, the incidence of abortion in diabetic patients is much higher than in healthy women.

Chronic nephritis often leads to abortion or to premature labour. In such cases the placenta usually contains a large number of white infarcts.

Other Chronic Medical Diseases In morbus cordis with decompensation, in chronic bronchitis, in chronic blood diseases, and in exophthalmic goitre, the incidence of abortion is higher than with healthy women. It is important to realise, however, that the majority of women with these chronic diseases go to term.

Drugs Phosphorus, lead, quinine, ergot, pituitrin and mercury, when administered in large and poisonous quantities during pregnancy, usually lead to abortion. Drastic purgation during the early weeks of pregnancy may also be followed by evacuation of the uterus. Many drugs are used illegally as abortifacients, amongst them are ergoapiol and pennyroyal. Very large doses of such drugs must be administered, however, before abortion takes place, and it is probable that none of the drugs mentioned has ever produced abortion in a healthy woman unless it has been administered in doses sufficient to produce a toxic effect upon the mother.

Injuries Accidents and injuries to the lower abdominal region and the vulva may lead to abortion either because of the formation of hematomata in the region of the uterus, or because the placenta is directly dislodged during the injury.

Under this heading the methods which are used in criminal abortion may be considered. A method which is extensively practised is the injection of soap and water solution under pressure into the cervical canal with a Higginson's syringe. The method is extremely dangerous, because the woman may die immediately from shock, or she may develop sepsis, or the solution may be forced through the Fallopian tubes into the peritoneal cavity. Other criminal methods are the introduction of knitting needles, gum elastic, or metal catheters into the uterus, in the hope that the membranes will be ruptured, or that the placenta will be dislodged. Glycerine is sometimes injected into the cavity of the uterus, and bismuth pastes are also forced into the uterus under pressure. An ingenious method is to pass a diathermy current through the uterus. A thin metal rod is introduced into the cervical canal, the opposite pole being the usual flat lead plate placed over the patient's back. There is little risk of sepsis, but it is unusual for the ovum to be extruded until some considerable time has elapsed from the operation.

Disturbances of the Endocrine System It is established that the secretions of the corpus luteum are essential for the embedding of the fertilised ovum, so that pregnancy terminates in abortion unless a healthy corpus luteum is present in the first few weeks of pregnancy. After the first few weeks, the functions of the corpus luteum are replaced by the placenta, and both ovaries may then be removed, and yet the patient go to term. It is possible that repeated abortions in early pregnancy may be caused by defects in the function of the corpus luteum. Similarly, in severe degrees of dysfunction of the ductless glands there is usually a well marked tendency to abortion, although the precise factors which lead to abortion are little understood.

Psychical Causes It is well known that frights and acute mental disturbances may cause abortion. Little is known of the exact ætiology, and it is difficult to assess the frequency of this type of case.

THE MECHANISM OF ABORTION

The general features of the evacuation of the uterus during the process of abortion correspond to what happens during normal labour at term, in that the cervix dilates and the body of the uterus contracts and retracts. On the other hand, the

mechanism of separation and discharge of the ovum from the uterus are often quite different, particularly in the early weeks of pregnancy. Abortions may be classified into two main types, typical and atypical.

Typical Abortion (1) In this method which is only possible in the early weeks of pregnancy the vera and basalis layers of

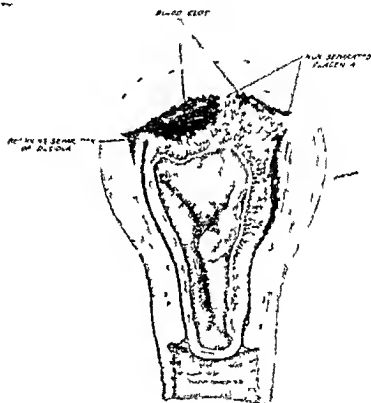


FIG. 8. Mechanism of abortion. (After a at) Hollands Obstetrics)

the decidua separate from the uterus so that the entire decidua and ovum are together expelled during the abortion. The method was familiar to Matthews Duncan. Specimens of abortion material of this kind are interesting because they show the relation of the decidua vera and the decidua reflexa to the ovum.

(2) The more common method of typical abortion consists in

a primary detachment of the ovum by means of a retroplacental clot. The ovum is pushed into the cavity of the uterus and is extruded from the cervix. The inverted decidua vera, still attached to the ovum, being last to be born. In most cases the lower pole of the ovum first appears through the cervical canal, then follows the amniotic cavity and the placenta and finally the inverted decidua vera. The method is similar to the Schultze's method of separation of the placenta. This mechanism of abortion is the one which usually occurs in the early months of pregnancy.

Atypical Abortion. Four methods were described by Ahlfeld —

(1) The ovum, covered by the decidua reflexa, is detached from the decidua vera and is extruded from the uterus, the decidua vera coming away later. The mechanism is seen frequently, and according to Seitz, is most common between the third and fifth months.

(2) The ovum is extruded without any decidual covering the chorion having been detached from both the decidua basalis and decidua reflexa over the whole of the ovum. The decidua vera and decidua reflexa come away later.

(3) Very rarely the fœtus, covered only by the amnion, is detached and extruded, the placenta and decidua being discharged later. This mechanism is the least frequent of all.

(4) The fœtus alone is extruded. Later the chorion, amnion and decidua are discharged. This method is seen very frequently, and gives rise to the familiar clinical case of incomplete abortion.

The above classification is not altogether satisfactory because it omits reference to the clinical condition missed abortion, first described by Matthews Duncan in 1879. In missed abortion, the ovum is separated from its attachment to the uterus to a degree sufficient to kill the embryo, but the detached ovum, instead of being extruded from the uterus, is retained. Matthews Duncan pointed out that the ovum might be retained in the uterus until the end of the normal period of gestation of forty weeks, without increasing in size from that which it had attained when dislodged from the decidua. In missed abortion the signs of pregnancy disappear. There is no further enlargement of the abdomen. The symptoms, frequency of micturition and morning vomiting clear up, and fœtal movements are not felt. Often a brown discharge develops from the uterus, and the patient herself may show evidence of toxic absorption, and

may feel ill. A large number of cases of missed abortion are due to the condition *carneous mole*, which will be described in detail later. Sometimes no explanation for the retention of the ovum can be offered, although such conditions as retroflexion and endometritis have been suggested as the determining factors. In due course the uterus contracts and expels the ovum and, again, no satisfactory explanation has been suggested of the factors which determine the onset of uterine contractions.

PATHOLOGICAL ANATOMY OF ABORTION

Many different types of degenerative processes can be recognised if abortion material is examined. If the *fœtus* has been retained *in utero* for any length of time after death, it undergoes *maceration*. Between the third and sixth months the *fœtus* may undergo *mummification* while very occasionally, as the result of an extreme degree of maceration, the *fœtus* may eventually be represented by a macerated skeleton. *Lithopædion* formation, in which the *fœtus* becomes calcified, is also described, although seen far less frequently than with *ectopic gestation*. In many cases of abortion the placenta is infiltrated with blood clot, the chorionic villi are matted together, and large white infarcts are commonly found. An *endarteritis obliterans* is invariably found in *sylphus*, but it is also seen apart from this disease.

Placental Polypus. In some cases of abortion a small piece of placenta is retained in the uterus through adhesion to the uterine wall. Placental polypi vary between the size of a pea and that of a walnut, and project downwards towards the internal os. The polypi are plum coloured, soft and friable, and when the cut surface is examined, placental like tissue can be distinguished. The polypi contain degenerate chorionic villi, although in some cases the chorionic tissues appear to be healthy. Usually, however, the epithelial cells show pyknosis and karyorrhexis, and the majority of the villi are denuded of epithelium. Little is known of the etiology of placental polypi and there is great difficulty in explaining the attachment of the polypus to the uterine wall. Placental polypi lead to severe uterine hæmorrhage and discharge, and very rarely may cause pyrexia through infection.

Carneous Mole. In *carneous mole* the *fœtus* is destroyed by a diffuse subchorial hæmorrhage, which is spread diffusely around

the ovum, but which does not involve the amniotic cavity. In the early stages, when the blood is soft, the term blood mole is used. Later, when the blood clots fibrose, the term fleshy mole is employed, while the end result is sometimes a stony mole as the result of the deposition of calcium salts in the blood clot around the ovum.

Carneous mole was accurately described in 1892 by Breus. Breus emphasised three characteristics of the carneous mole :—

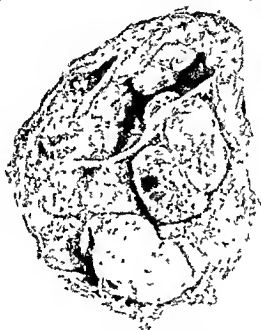


FIG. 88. Carneous mole.

(1) The presence of circumscribed hæmatomata in the chorio-decidual space, which give a lobulated or fibrous appearance to the inner surface of the amnion.

(2) A disproportion between the size of the embryo and the size of the amniotic cavity. In typical cases the embryo is far smaller than would be expected from the size of the mole, and in some cases the embryo disappears completely.

(3) A disproportion between the size of the embryo of the abortion and the pregnancy. In some cases the mole may be retained in the uterus as long as eleven months after the last

menstrual period yet when the specimen is examined the embryo is seldom more than 2 cm in length

Little is known of the aetiology of carneous mole Breus's terminology of subchorial hematoma is no longer accepted, for it is now established that the clots are formed in the intervillous space A carneous mole is easily recognised on microscopical examination by the presence of large deposits of calcium salts



FIG 89 A carneous mole The mole consists of degenerate chorionic villi The dark areas in the photograph represent deposits of calcium salts

in the blood clot It is quite clear that Matthews Duncan included cases of carneous mole in those he grouped together under the name 'missed abortion' Carneous mole should not be regarded as a common complication of pregnancy, for specimens are seen only very rarely

Endometritis Post-abortion Subinvolution of the Endometrium

One of the commonest complications of abortion is persistent uterine bleeding after the foetus and placenta have been dis

charged from the uterus. The cases must be distinguished from those of septic abortion when there is well marked pyrexia and purulent offensive blood stained discharge. In many cases of persistent hæmorrhage subsequent to abortion no obvious cause for the bleeding can be discovered. The uterus may be of normal size, anteflexed, and freely movable, and the appendages may be normal. Sometimes the uterus is retroflexed, but it does not follow that the retroflexion of itself is responsible for the persistent bleeding.

Cases of this kind are very frequent, and in the absence of localising signs, it is customary to explain them by assuming a low degree of inflammation of the mucous membrane of the uterus. It is well known clinically that the hæmorrhage usually clears up spontaneously after about six to eight weeks, and that the administration of ergot is a useful therapeutic measure. If the uterus is curetted, a placental polypus may be found, which is of itself sufficient to explain the symptoms, and the removal of which is followed by the cessation of bleeding. Placental polypi, however, are relatively rare, and the majority of cases of this clinical group have to be explained in some other way. Examination of the curettings often shows relics of chorionic villi and decidual cells with extensive infiltration of the stroma with leucocytes and plasma cells. The chorionic villi are mainly degenerate with loss of epithelial covering and fibrosis of the stroma. If a large amount of chorionic tissue has been retained, it is not uncommon to find an extensive leucocytic infiltration together with an infection by saprophytic organisms. In such cases, the symptoms are caused partly by the retained products of conception, and partly by a true infection of the endometrium. Heuck examined 47 cases of persistent bleeding following abortion and found chorion and decidua in 15 cases, decidua alone in 22, and neither chorion nor decidua in 10. It seems, therefore, that two types of case can be distinguished, one when there are retained products of conception, the other when chorionic tissues cannot be demonstrated in the curettings. The etiology of this second group is very obscure. There is usually no direct evidence of an infection of the mucous membrane of the uterus, although there may be a leucocytic and plasma cell infiltration, and the cases should be regarded as representing subinvolution of the endometrium. Probably there is some disturbance in the production of the female sex hormones, for it is fairly common to find a corpus luteum cyst in one or other ovary.

Severe post abortion hæmorrhage is almost always due either to retained products or to a placental polypus, and there should be no hesitation in curetting the uterus in such cases. Minor degrees of post abortion bleeding should be attributed to sub involution of the endometrium, and in such cases curetting is not always a satisfactory method of treatment. Treatment should be conservative, and in due course the hæmorrhage will clear up spontaneously.

In all cases of persistent uterine bleeding following abortion, the possibility of the development of chorion epithelioma should be borne in mind. The presence of small cysts in the ovaries and of a positive Zondek Aschheim test are very suggestive of this possibility. Chorion epithelioma will be described in detail later in this chapter.

CLINICAL ASPECTS OF ABORTION

It has been customary to classify abortion into three clinical groups, namely, threatened, inevitable and missed. Another method is to regard abortions as being either complete or incomplete. It is impossible, however, to make a satisfactory classification of all the clinical types of abortion or of its complications.

Threatened Abortion

In the majority of cases, the symptoms of threatened abortion develop during the early weeks of pregnancy. The main symptom is vaginal hæmorrhage, which is accompanied by intermittent pain in the lower abdomen and back. On examination, blood is seen to be discharged through the cervical canal, but the os is closed. The uterus has the normal characteristics of a pregnant uterus of that stage of gestation. In many cases of this kind the bleeding clears up under appropriate treatment, and the pregnancy continues to term. On the other hand, the syndrome of threatened abortion may represent the early stages of an abortion which will become inevitable, and there is no method of distinguishing between the two types of case except by expectant supervision. Severe bleeding, or very painful uterine contractions, however, indicate that the abortion is likely to become inevitable.

The diagnosis of threatened abortion may be difficult. First and foremost in the differential diagnosis comes ectopic gestation for in both conditions a history will be obtained of early preg-

nancy followed by uterine bleeding. In ectopic gestation there is always a history of severe abdominal pain which often causes fainting and vomiting. Moreover, the vaginal bleeding in ectopic gestation is small in amount, and the discharged blood is dark and often coagulated. All patients with the symptoms of threatened abortion should therefore be subjected to a careful bimanual examination to exclude the presence of an adnexal swelling. Apart from ectopic gestation, vaginal bleeding in early pregnancy may be produced by such local abnormalities of the cervix as mucous polypus, vascular erosion and early carcinoma. The cervix should, therefore, be examined with a speculum in all cases of vaginal bleeding in early pregnancy. It has already been pointed out that some patients develop vaginal bleeding at times corresponding to the suppressed periods during the early months of pregnancy. It is impossible to distinguish such cases from those of threatened abortion.

Treatment of threatened abortion consists in absolute rest in bed, combined with the administration of such drugs as opium and codeine. Drastic purges are contra indicated. If the abortion becomes inevitable the bleeding persists, and in due course the uterus discharges the ovum. If, however, the abortion is only threatened the hæmorrhage clears up. The patient should subsequently be examined carefully in case the ovum was killed at the time of the vaginal bleeding, to be retained in the uterus as a missed abortion. It is customary with threatened abortion to insist upon the patient remaining in bed throughout the times of the suppressed periods until the end of the fourth month of pregnancy has been passed. If the patient can determine these times accurately, then the procedure should be recommended, but the calculation of these times is not usually a simple matter.

It is customary at the present day to treat cases of threatened abortion with progesterone. The theoretical basis for the treat³ment is the possibility that progestin secretion is deficient. As a general rule, the treatment is empirical. It is usual to give 5 mgm of progesterone daily by injection. The anterior pituitary sex hormones have also been employed in the treatment of threatened abortion and the treatment has its advocates.

Inevitable Abortion

In inevitable abortion the vaginal bleeding is usually severe and the uterine contractions more painful than with threatened

abortion In typical cases the cervical canal is dilated so that a finger inserted into the cervical canal palpates the lower pole of the ovum If convincing evidence can be obtained of the discharge of liquor amnii the abortion must be regarded as inevitable In such cases bimanual examination detects that the globular feel of the uterus is less marked than in normal pregnancy, and the uterus feels flattened antero-posteriorly If the umbilical cord prolapses, or if the foetus is discharged, the abortion obviously must be inevitable

If an abortion is established as inevitable there is no object in administering sedative drugs One of the first principles in the treatment of abortion is to avoid interference except when active treatment is clearly indicated, for the majority of abortions terminate spontaneously without complications and medical interference is not required If, however, severe hæmorrhage complicates abortion then such drugs as ergot and pituitrin should be administered to cause the uterus to contract and empty itself as quickly as possible It is well known clinically that some time may elapse between the onset of an abortion and the evacuation of the uterus In such cases there is no objection to the administration of ergot or pituitrin when once the abortion is definitely diagnosed as inevitable The complications of inevitable abortion will be described later

Missed Abortion

The clinical history of missed abortion is very characteristic At first, the patient suffers from the normal symptoms of early pregnancy, such as morning vomiting and frequency of micturition Then, at about the 12th week of gestation, there is a little vaginal hæmorrhage, which soon clears up and which is succeeded by a period of amenorrhœa There is, however, no further enlargement of the breasts, no enlargement of the abdomen, and the symptoms of pregnancy gradually subside Usually, after several weeks and perhaps after several months, a brown discharge develops and eventually the uterus contracts and expels the ovum, which usually takes the form of a carneous mole The diagnosis of missed abortion may present difficulties For example, a woman may miscarry early in pregnancy and then conceive immediately afterwards, so that when examined about eight weeks after the miscarriage the uterus is found to be slightly enlarged If the history of the miscarriage is indefinite

the case may be regarded as one of missed abortion, and if the uterus is then evacuated a normal pregnancy may be removed.

The treatment of missed abortion depends to some degree upon the inclination of the patient. In missed abortion the ovum will come away of its own accord in due course. Some women may be content to wait for the spontaneous evacuation of the uterus, but, as a general rule, patients insist upon the uterus being emptied as soon as possible. The best method of treatment is to insert laminaria tents into the cervical canal, when the uterus will usually expel the mole within forty eight



FIG 90 A laminaria tent

hours. The technique of evacuation of the uterus will be described in detail below.

Incomplete Abortion

It has already been pointed out that retention of the placenta is one of the common complications of abortion. In such cases the patient complains of vaginal hæmorrhage, which takes the form of a continuous ooze of blood and which may lead to a severe degree of anæmia. The hæmorrhage comes from the placental site, for the placenta has usually separated partially, so that the sinuses of the placental site bleed when the uterus relaxes. In many cases, the administration of ergot and pituitrin, by leading to contraction of the uterine muscle, causes expulsion of the placenta, and this method of treatment should first be tried except when the vaginal bleeding is very severe. If the vaginal hæmorrhage is severe the uterus should be evacuated by operation, for no time can be lost by the conservative method of administering drugs.

Evacuation of the Uterus

See p. 152
21 6 4

The operation of evacuation of the uterus is simple to perform if the technique is correct, but it is not uncommon for serious mistakes to be made.

The patient should be anæsthetised and placed in the lithotomy position. The vulva should be shaved, the bladder emptied with a catheter, and the vulva cleaned with ether and a suitable

antiseptic solution such as tincture of iodine. A vaginal douche should then be given to irrigate away blood and blood clot, and the most useful solution to use for the vaginal douche is one containing 1 dram of tincture of iodine to a pint of water at a temperature of 105°F . The operation area should be surrounded by sterile towels, and the operator should wear a sterile gown, cap and mask, and sterile gloves. A bimanual examination is then made to determine the position of the uterus and

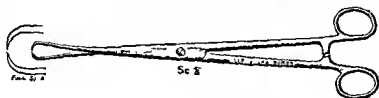


FIG 91 Volsellum forceps

the degree of dilatation of the cervix. The cervix must be sufficiently dilated to admit one finger before the uterus can be evacuated. If necessary, therefore, the cervix must be dilated with Hegar's dilators up to about a No 18 dilator, suitable specula being introduced to expose the cervix and a volsellum forceps being placed upon the anterior lip of the cervix. When the cervix admits one finger, either the whole hand or half hand is introduced into the vagina and the index finger passed into the



FIG 92 Volsellum forceps

uterus. The external hand presses down the fundus of the uterus, and in this way the index finger of the right hand can reach the fundus of the uterus. It is impossible for the operator to reach the fundus of the uterus with his index finger if only two fingers are inserted into the vagina. It is essential that either the hand or half hand should be introduced into the vagina before the index finger is passed into the uterus. The index finger now sweeps round the wall of the uterus and separates the retained products from their attachment to the

uterine wall. The right hand is withdrawn, a speculum introduced into the vagina, and the anterior lip of the cervix drawn down with volsellum forceps. A pair of ovum forceps is next

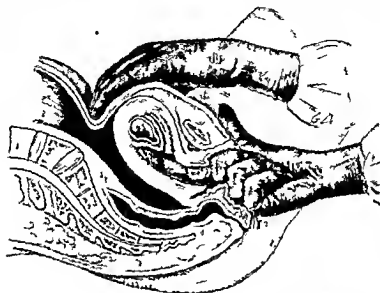


FIG 93 The technique of evacuating the uterus of retained products (Jelliffe's Midwifery)

introduced into the cavity of the uterus and removes the retained products. Subsequently, the index finger is introduced again into the uterus to make quite certain that all relics of the placenta have been removed. An intra uterine douche is now

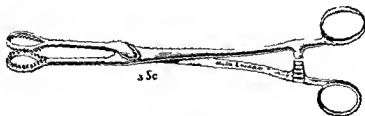


FIG 94 Ovum forceps

given, and again the best solution to use is one containing Dettol 1 oz. to the pint at a temperature of 105° F. The object of the douche is twofold, not only does it irrigate away any organisms that may have been introduced, but it causes the uterus to contract and controls hæmorrhage. It is true that douches at a higher temperature are more effective in controlling hæmor-

rhage, but they damage tissues which subsequently lose their resistance to infection. The douche nozzle should be two-way, and the douche can should be raised not more than 1 ft. above the level of the patient. If a single-way douche nozzle is used and the solution run in under high pressure, some of the fluid may pass along the Fallopian tubes into the peritoneal cavity and lead to peritoneal irritation and in septic cases to pelvic peritonitis.

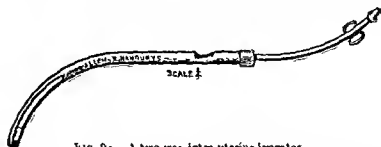


FIG. 92. A two-way intra-uterine irrigator.

Although the operation can be performed easily and rapidly in the majority of cases, errors in technique may lead to serious complications.

Complications

Shock. If a cervix is rapidly dilated with dilators and if the patient is already anæmic, profound shock may follow the operation. It should be regarded as an error of judgment to evacuate rapidly the uterus of a woman who is already severely anæmic. In such cases the evacuation of the uterus should always be preceded by blood transfusion.

Hæmorrhage. It is not uncommon for severe bleeding to develop from the uterus as soon as retained products have been removed. Hæmorrhage of this kind is most frequent in septic cases. Treatment consists in intramuscular injections of pituitrin and in the use of an intra-uterine douche, while in intractable cases the uterus should be plugged with dry sterile gauze. The gauze should be removed within twelve hours, otherwise it may lead to severe infection of the uterus.

After evacuation of the uterus, it is usual for the uterine bleeding to clear up spontaneously within a few days. Persistent hæmorrhage is most likely to be due either to subinvolution of the endometrium or to a low grade infection.

Sepsis It is not uncommon for saprophytic organisms to invade the uterus when a piece of placenta has been retained, and a moderate degree of pyrexia is, therefore, not unusual. In most cases, evacuation of the uterus is followed by a fall in temperature without further complications. Unfortunately, from time to time, after the evacuation of the uterus an acute septicæmia is lighted up, and it is a difficult clinical problem to foresee whether this complication will follow the operation. The modern treatment is to give sulphapyridine or sulphanil amide in large doses, and as a general rule, it will be found that the temperature subsides in four to five days' time, when it becomes reasonably safe to evacuate the uterus. The objection to this expectant method of treatment is that the infected retained products may lead to the development of salpingitis and tubo-ovarian abscess. It is often a difficult clinical problem to decide whether to evacuate the uterus early or whether to treat by chemotherapy and to delay evacuation until the temperature has returned to normal. From time to time cases of septic abortion are seen, when the uterus and its contents are infected before any part of the ovum has been extruded. Indeed, after therapeutic abortion with the use of laminaria tents, some degree of pyrexia frequently arises immediately prior to the discharge of the ovum. In cases of this kind it is best to treat the case conservatively by chemotherapy and to await the evacuation of the uterus. Retained pieces of placenta can be removed after the temperature has returned to normal. If, on the other hand, septic abortion is complicated by severe hæmorrhage, immediate evacuation of the uterus may be imperative and conservative treatment unjustifiable.

The development of acute septicæmia after an evacuation of the uterus is, therefore, one of the important complications of abortion, and tragic cases are seen from time to time.

If the uterus is irrigated with fluid under high pressure, there is always a possibility of the douche solution passing along the Fallopian tubes into the peritoneal cavity and leading to pelvic peritonitis. Similarly, in septic abortion, the infection may spread upwards and involve the Fallopian tubes during the 2nd week.

Thrombo-phlebitis Thrombo-phlebitis of the pelvic veins and of the femoral and saphenous veins is a fairly common complication of septic abortion. If the thrombo-phlebitis is

restricted to the veins of the leg the patient develops white leg, which is usually on the left side. Thrombo phlebitis of the pelvic veins causes persistent pyrexia which may last for many weeks. Suppurative thrombo-phlebitis may lead to pyæmia, with metastatic infection in the lungs and the subcutaneous tissues.

Injuries *Lacerations of the Cervix* If the cervix is rapidly dilated with Hegar's dilators the soft cervix may split, and if the laceration spreads outwards, the uterine vessels may be torn and the patient develop a hæmatoma of the parametrium. The hæmatoma usually becomes infected and causes a parametric effusion or abscess.

Perforation of the Uterus The uterus may be perforated during illegal operations, when the instrument may be pushed through the posterior wall of the uterus into the peritoneal cavity. As a result a pelvic peritonitis may be lighted up, and many fatalities of illegal abortion are caused in this way. Sometimes the small intestine becomes adherent to the laceration in the wall of the uterus, and as the result of the contractions of the muscle wall of the uterus the small intestine may become drawn into the uterus, and in due course may appear at the vulva. The uterus may also be perforated by a metal dilator during the dilatation of the cervix during the operation of evacuation of the uterus of retained products. The wall of such a uterus is soft, and the dilator is not held up by the usual resistance when it encounters the wall of the uterus, so that the dilator may be pushed in further and so perforate the uterine wall. The customary treatment of perforation of the uterus is to perform immediate hysterectomy in septic cases while if the abortion is afebrile and the evacuation performed under strict aseptic precautions, an expectant policy is justified.

Septic Abortion

It has already been pointed out that the most severe types of septic abortion follow upon criminal procedures, when solutions and instruments are introduced into the cavity of the uterus without proper aseptic precautions being taken. The worst forms are those in which the uterus is perforated and an acute peritonitis lighted up. Again the evacuation of the uterus may light up a latent infection of the septicæmic type. Other forms of sepsis, such as parametritis, thrombo phlebitis and white-leg,

salpingitis and tubovarian abscess, are seen very frequently in septic abortion. These complications are essentially similar to those found in puerperal sepsis, and their treatment should be carried out along similar lines.

The treatment of these cases has already been considered on p. 285.

CHAPTER XIII

PATHOLOGY OF PREGNANCY

HYDATIDIFORM MOLE AND CHORION EPITHELIOMA

IN hydatidiform or vesicular mole, the chorionic villi are distended with fluid and form translucent vesicles measuring about $\frac{1}{4}$ in. in diameter. In most cases the vesicular degeneration is spread uniformly over the chorion, the amniotic cavity is obliterated, and the embryo and its umbilical cord disappear. The vesicles are usually covered with blood clot and fragments of decidua. The curious appearance has been recognised for

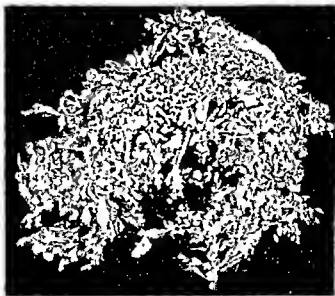


FIG. 96 Hydatidiform mole

centuries, and in olden times strangely fantastic interpretations were suggested.

Morbid Anatomy

The vesicles vary in size. Usually about $\frac{1}{4}$ in. in diameter, they sometimes attain the size of a pigeon's egg, and are oval in

shape. They develop only in the terminal branches of the chorionic villi, the main stalk always being unaffected. Vesicular degeneration is, on rare occasions, restricted to part of the placenta, the rest being normal in structure and function, so that the pregnancy may proceed to term. In twin pregnancy the degeneration may be restricted to one ovum, the placenta and foetus of the second ovum developing normally. Vesicular degeneration may also arise in ectopic gestation.

The histological appearances are difficult to interpret. Formerly it was believed that the vesicles were produced by a myxomatous degeneration of the chorionic villi, but as no mucin reaction is given by the contained fluid, it is now believed that the vesicular fluid is formed partly by degeneration of the stroma, and partly by secretion from the covering cells of the villi. It was shown by Marehand that the essential histological feature of hydatidiform mole was a proliferation of the epithelium covering the villi. This proliferation is irregularly distributed over the villi, so that in some places the wall is thin and translucent, while in other areas a thick layer of epithelium can be detected with the naked eye. The proliferation of the epithelium leads to an appearance incapable of interpretation without some previous knowledge of the development of the trophoblast in the early human ovum. In the first few days of development of the human ovum the trophoblast becomes subdivided into cytotrophoblast and plasmoditrophoblast, the former eventually giving rise to Langhan's cells, the latter to the syncytium. In the earliest stage of development of the human ovum the cytotropho-



FIG 97. Hydatidiform mole. Low power. The chorionic villi are distended and the covering epithelium is thinned out. The massed cells surrounding the villi consist mainly of cytotrophoblast with very little syncytium. Activity of Langhan's layer is one of the most important and constant features of hydatidiform mole.

blast proliferates far more than the plasmoditrophoblast. At this stage it is composed of large irregular nucleated cells which are matted together and show a tendency to be grouped into bunches. Many of the cells contain vacuoles, and large clear spaces are frequently seen between individual cells. In hydatidiform mole, masses of cells, similar in every way to the cytotrophoblast of the early human ovum, are distributed irregularly over the vesicles. Proliferation of the syncytium



FIG. 98. Hydatidiform mole, showing the proliferation of Langhan's layer.

cannot be regarded as an essential feature of hydatidiform mole.

The stroma of the villi is degenerate, and the cells which remain stain feebly and indistinctly. Another curious feature is that the blood vessels have disappeared from the affected villi. It is difficult to explain how vesicular fluid is produced, and a satisfactory solution has not yet been offered. The constant feature in all cases of hydatidiform mole is the proliferation of Langhan's layer to produce primitive cytotrophoblast.

Some hydatidiform moles erode the wall of the uterus, burrow into the myometrium, and may even burst through the uterus into either the peritoneal cavity or the broad ligament, when dangerous internal hæmorrhage may ensue. Little is known of how a hydatidiform mole is attached to the wall of the uterus,

and it is possible that even a simple hydatidiform mole invades the wall of the uterus to some degree. No histological method is known of distinguishing between a burrowing hydatidiform mole and one which is benign, nor is it possible to say on histological grounds whether a particular hydatidiform mole is likely or not to be followed by chorion epithelioma.

Ovarian Changes. There is a well-marked tendency for cysts to be found in the ovaries in cases of both hydatidiform mole and chorion epithelioma. The cysts seem to have been described first by Mme. Boivin. In most cases the cysts are bilateral, and as many as fifteen or twenty cysts, of about 1 in. in diameter, may be found in the same ovary. Cysts up to a diameter of 4 in. have been described, but large cysts are exceptional. The surface of the ovary is smooth and free of adhesions, but a nodular appearance is produced by the cysts projecting towards the peritoneal cavity. The cysts are thin-walled, with smooth inner surfaces, and contain a clear fluid tinged with yellow. Frequently fibrinous material is found in the cyst after the fluid has been drained away. In most cysts yellow material can be seen in the wall. The cysts seem to be of a similar type both with hydatidiform mole and chorion epithelioma. It has been shown recently that the cysts are granulosa lutein in type, that is to say, they show luteinisation of both the granulosa and theca interna layers of the follicle. Luteinisation of the granulosa layer is better marked than of the theca interna, and the lutein cells attain the size of those found in the corpus luteum of pregnancy. The lutein cells are, however, slightly different from the lutein cells of the corpus luteum of pregnancy, for they are never conjoined nor do they contain



FIG. 99. The ovary from a case of hydatidiform mole. The ovary is studded with small cysts.

colloid droplets. Granulosa lutein cysts of this kind are found in 59 per cent of cases of hydatidiform mole and in 9.4 per cent of cases of chorion epithelioma. In hydatidiform mole they rapidly retrogress after the expulsion of the mole. Slow retrogression or persistence of the cysts cannot be regarded as indicative of the development of chorion epithelioma. Much more important in detecting early stages of chorion epithelioma is the persistence of a positive Zondek Aschheim reaction in the urine.

Ætiology. Hydatidiform mole arises more frequently in multiparæ (70 per cent of cases) than in primiparæ (30 per cent of cases). The majority of cases arise between the ages of 30 and 40, although the condition is not uncommon between 20 and 30, and cases are seen from time to time in patients of menopausal age. The incidence of hydatidiform mole is of the order of 0.04 per cent of all pregnancies.

Little is known of the ætiology of hydatidiform mole. The association of lutein cysts of the ovaries and vesicular degeneration of the chorion has led to almost every theoretical possibility being explored. The primary fault almost certainly lies with the ovum itself, for the vesicular degeneration may be limited to the chorion of one ovum of a twin pregnancy. Again, the hydatids may be restricted to a localised area of chorion. In 1918, Aschner showed that the injection of placental extracts into female animals led to the formation of cysts in the ovaries which were similar to those found with hydatidiform mole. This pioneer observation of Aschner can now be interpreted in terms of the anterior pituitary sex hormone, for Aschner's extracts almost certainly contained this hormone. The ovarian changes are indeed almost identical with those found with a positive Zondek Aschheim test. The modern view of the formation of the ovarian cysts is that they are caused by the anterior pituitary sex hormone being present in excess in the maternal circulation. This view is corroborated by assay of the prolactin content of the urine in hydatidiform mole pregnancy. The Zondek Aschheim reaction is strongly positive and it is usual for more than 200,000 units per litre to be found in the urine of women suffering from hydatidiform mole. This concentration falls, however, if the mole degenerates and is retained in utero. The primary fault seems to be the reversal of Langhans cells into primitive cytotrophoblast. Why this should be is, of course, unknown.

Symptoms and Diagnosis. Hydatidiform mole usually leads

to abortion between the fourth and sixth months of pregnancy, although very rarely the mole may be retained *in utero*, like a carneous mole, until term. In approximately half the cases, the abortion is spontaneous and medical treatment is not required. The diagnosis of hydatidiform mole may offer a difficult clinical problem, for it is generally agreed that such a pregnancy should be terminated at once and an inaccurate diagnosis may lead to interference with a normal pregnancy.

The most important symptom is vaginal bleeding, which takes the form of irregular small hæmorrhages, often combined with a watery discharge, and, on rare occasions, with the passage of the characteristic vesicles. The hæmorrhage usually starts during the second month of pregnancy, and recurs irregularly until the time of abortion when severe bleeding may develop.

Symptoms of toxæmia are frequent with hydatidiform mole. The patient feels ill throughout the pregnancy and suffers from headaches and malaise. Excessive vomiting is not uncommon, the blood pressure may be raised, and the feet may become cedematous. There is usually some degree of albuminuria and casts may be found in the urine. The uterus is larger than would be expected from the calculated stage of gestation and has a peculiar tense consistence. A foetus cannot be outlined, the foetal heart cannot be heard, nor can a foetus be detected on X rays examination. Similarly, there is no history of quickening. In some cases the cystic ovaries can be palpated in Douglas's pouch, and it is well known that one or other ovary may undergo torsion during the pregnancy.

The diagnosis is usually extremely difficult until vesicles have been discharged through the cervix. Hydramnios, mistaken dates, twins, and lastly, concealed accidental hæmorrhage (though very rare at this stage of pregnancy) must all be considered in the differential diagnosis. The most important points in the establishment of a diagnosis are a strong Zondek Aschheim reaction of the urine, the absence of foetal parts in an X rays examination, and the presence of palpable ovarian cysts in the pouch of Douglas.

Treatment In half the cases the abortion is spontaneous, but there is always a tendency for the abortion to be accompanied by severe uterine bleeding. In such cases it is unusual for large pieces of the mole to be retained *in utero*, and the hæmorrhage can be controlled by the administration of pituitrin and ergot. The type of case which causes difficulty is when

there is fairly severe persistent uterine bleeding prior to dilatation of the os. The evacuation of the uterus can then be assisted by the introduction of either laminaria tents or a small hydrostatic bag according to the degree of dilatation of the cervix. It is not uncommon, however, for severe hæmorrhage to accompany the abortion if these methods have been adopted. There is therefore a tendency at the present day to prefer to evacuate the uterus by abdominal hysterotomy, if the case is clean. The abdominal operation allows the uterus to be emptied completely and there is little danger of severe uterine bleeding, for pituitrin can be injected directly into the uterus during the operation when necessary. Further, the perforating type of hydatidiform mole can be recognised if the abdomen is opened, when hysterectomy should be performed. Again, chorion epithelioma is more likely to develop after hydatidiform mole in patients over the age of 40, so that with multiparæ, approaching menopausal age, there is much to be said for removing the uterus in cases of hydatidiform mole.

The three great complications of hydatidiform mole are hæmorrhage, sepsis, and the development of chorion epithelioma. Appallingly severe uterine bleeding may accompany the abortion of a hydatidiform mole and repeated blood transfusions may be necessary. The hæmorrhage should be controlled so far as possible by the administration of pituitary and ergot. Digital evacuation of the uterus is not to be recommended, for it is technically extremely difficult, so that in some cases it may be impossible to remove the whole of the mole, and moreover, the uterus may be perforated, if the mole is of the infiltrating type.

Persistent uterine hæmorrhage following upon the abortion of the hydatidiform mole is a common complication. The hæmorrhage may be profuse and may last for several weeks after the abortion. In some cases the hæmorrhage is caused by the retention of small fragments of the mole, in other cases by an endometritis, and in others by the development of a chorion epithelioma, but in the majority of cases it must be attributed to a subinvolution of the decidua. Preliminary treatment consists in the administration of ergot. At the end of ten days, if the bleeding persists, a Zondek Aschheim test should be made. It is now maintained that if the reaction is positive after fifteen days from the abortion of the mole, chorion epithelioma should be suspected. It is found clinically that persistent hæmorrhage following upon hydatidiform mole usually clears up after curetting

during the 2nd week, unless a chorion epithelioma develops

Sepsis is a common complication of hydatidiform mole, particularly if manipulations such as introduction of tents or digital evacuation of the uterus have been carried out. It is not infrequent for patients to run temperatures of 103° and 104° F immediately after the abortion, and for the lochia to be purulent and offensive. As a result of sepsis and the frequently associated anæmia, patients are often dangerously ill during the puerperium. Treatment consists in blood transfusion and the administration of ergot. Glycerine injections into the uterus are recommended by some authorities, but it is perhaps better to avoid local treatment completely.

All patients who have had hydatidiform mole should be kept under careful observation for some months afterwards. Approximately 14 per cent of patients with hydatidiform mole subsequently develop chorion epithelioma, and the earlier the diagnosis of chorion epithelioma is established the better are the results of treatment. As already stated, the most reliable method of detecting the development of chorion epithelioma is by the Zondek Aschheim reaction of the urine. The reaction is positive after normal pregnancy until the eighth day of the puerperium, and if found positive fifteen days after the evacuation of a hydatidiform mole the case should be suspected of chorion epithelioma. The other clinical methods of recognising chorion epithelioma are not always reliable. Persistent uterine bleeding may be caused by subinvolution of the decidua, or by endometritis. On the other hand, persistence of cysts in the ovaries does not necessarily imply that a chorion epithelioma is developing. Again, the results of curetting may be misleading, for some chorion epitheliomata arise in the myometrium, out of reach of the curette. Consequently, if the maternal curetted away is innocent in structure chorion epithelioma is not necessarily excluded. Curiously enough, one of the earliest signs of chorion epithelioma may be the development of purple vascular and bleeding areas in the lower third of the vaginal wall. In practice, it is customary to examine patients who have had hydatidiform mole at fortnightly intervals.

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CHORION EPITHELIOMA

Chorion epithelioma, one of the most malignant growths arising in the body, is of some historical interest, for its pathology

was indeterminate until recently. In women the growth follows upon pregnancy, and the most recent figures of the incidence show that 40 per cent. of cases follow hydatidiform mole, 26.6 per cent. follow abortion, 19.8 per cent. follow normal labour, while 6.6 per cent. follow extra-uterine pregnancy. Somewhat similar growths arise in men from primary growths of the testicle, which are probably teratoid in type, and in such cases the Zondek-Aschheim reaction of the urine is positive. Chorion epithelioma should be regarded as a very rare tumour, and although the majority of cases are recorded the total number of cases known is not large.



FIG. 100. Chorion epithelioma of the uterus.

Morbid Anatomy

To the naked eye the growth appears as a solid purple friable mass. The majority of primary growths arise in the body of the uterus and develop first in the endometrium. In such cases the growth projects into the cavity of the uterus, quickly ulcerates and causes a bloodstained discharge, which later becomes offensive and purulent, as the growth becomes infected and necrotic. Growths of this kind superficially resemble placental polypi, but chorion epithelioma always infiltrates the wall of the uterus, while placental polypus is

clearly demarcated from the myometrium and can be easily detached from the wall of the uterus. Chorion epithelioma of the uterus does not necessarily develop primarily in the endometrium, and it is not uncommon for the growth to start in the myometrium, in the deeper tissues of the uterine wall. Such growths do not cause uterine bleeding in the early stages of their development, nor can they be detected by examination of scrapings removed by curetting. Primary chorion epithelioma of the

uterus may erode through into the peritoneal cavity or into the broad ligaments and cause diffuse bleeding, or it may cause enlargement of the uterus to such a degree that the fundus of the uterus reaches upwards to the level of the umbilicus. Metastases form early, dissemination usually taking place by way of the blood stream. Metastases, which can be detected early, are those found in the lower third of the vagina and at the vulva. Such metastases form purple hæmorrhagic projections either into



FIG. 101. Chorion epithelioma. The uterus and appendages. The uterus was full of blood, and blood clot discharged from the vascular growth to form a large hæmatometra.

the vagina or around the vaginal orifice. Their appearance is characteristic, and pathognomonic of chorion epithelioma. These metastases are interesting pathologically, for they are comparable to the vaginal metastases sometimes found with carcinoma of the body of the uterus and malignant ovarian tumours. Such metastases are produced by retrograde spread along the venous channels of the vaginal plexuses of veins. The general metastases probably develop early, the growth disseminating by way of the blood stream. Multiple metastases may form in the lungs and cause hæmoptysis. Deposits are

frequently found in the kidneys, brain, spleen, and liver, but when the dissemination is widespread almost any organ may be affected and large emboli may get held up in the large arteries of the systemic circulation. In advanced cases, the parametrium may be extensively infiltrated with growth. Invasion of the ovaries is usually by way of the blood stream. Ovarian cysts of the granulosa lutein type are found in 94 per cent of cases.

The histological appearances are very typical. Syncytium, cytotrophoblast and degenerate red blood corpuscles constitute the growth. Syncytium is not necessarily present in large amount, and in most cases the bulk of the growth consists of cytotrophoblast. The cytotrophoblast cells are actively growing, and show such malignant characters as atypical mitotic division. In some areas the cells are translucent or vacuolated and may resemble decidual cells. In typical cases no relics of chorionic villi can be detected, the growth consisting solely of embryonic syncytium, cytotrophoblast, and degenerate blood corpuscles. The primitive infiltrating properties of the embryonic cytotrophoblast are retained in chorion epithelioma, so that vessels are eroded and local hæmorrhages are produced, which cause the typical macroscopical appearances. Further, as a result of erosion of vessels the growth penetrates into the systemic blood stream, so that generalised metastases are apt to develop early.

There is clinical evidence that metastases may retrogress after the removal of the primary growth. The clinical evidence is convincing, although no satisfactory scientific explanation can be offered. It is well known, however, that with benign hydatidiform mole, syncytium may be demonstrated in the capillaries of the pulmonary circulation as Stevens has demonstrated very beautifully. It is possible that the body tissues are capable of disintegrating these trophoblastic fragments by the formation of lysins, provided that the fragments are not produced continuously and in excess from a primary growth. In chorion epithelioma as with hydatidiform mole, a strongly positive Zondek Aschheim reaction is given by the urine, and the test is of great value for the detection of developing metastases, for so long as the reaction remains positive, metastases must be suspected.

Symptoms and Signs Persistent or irregular uterine hæmorrhage following upon an abortion, particularly if a hydatidiform mole has been passed, should always cause chorion epithelioma to be suspected. In all suspected cases a Zondek Aschheim

test of the urine should be made. Further, the characteristic metastases in the lower part of the vagina may also help in establishing the diagnosis. The examination of scrapings from the cavity of the uterus, though perhaps the most convincing method of establishing the diagnosis, is open to the objection that curetting may cause further dissemination of the growth by opening up fresh venous channels. Moreover, curetting of the uterus will not dislodge fragments from primary growths arising in the myometrium. It should also be remembered that chorion epithelioma is, in the average case, more malignant in patients over the age of 40 than in younger women. In consequence there would be less hesitation in removing the uterus in a suspect case if the woman were approaching menopausal age. In some cases, therefore, the uterus should be removed without preliminary curetting.

Treatment In early cases, undoubtedly the best method of treatment is to remove the uterus by total hysterectomy. If the patient is young, the ovaries may be left, for ovarian metastases are rare with chorion epithelioma. On the other hand, the best results are obtained if the patient is treated with X rays subsequent to operation, and as ovarian tissue is destroyed by X rays it is only exceptionally that conservation of the ovaries would be considered. It is unnecessary to perform extended operations, such as Wertheim's operation, for vaginal metastases, and advanced growths which have infiltrated into the parametrium can be treated either with radium or deep X-rays. Chorion epithelioma is very radio sensitive, being 40-50 per cent more sensitive than normal tissues and between 20 and 30 per cent more sensitive than carcinoma of the cervix. Consequently, the modern tendency is to apply deep X rays to the pelvis after operation and the method is of some help in the treatment of metastatic growths. Good results have also been obtained after the use of radium in the treatment of such local metastases as those found in the lower part of the vagina. The progress of the case can be determined by repeated Zondek-Ashheim tests of the urine, for the reactions become positive if metastases develop.

CHAPTER XIV

PATHOLOGY OF PREGNANCY

ECTOPIC GESTATION

THE fertilised ovum is normally implanted in the upper part of the body of the uterus. Fertilisation probably takes place in the Fallopian tube, the ovum being subsequently transported by contractions of the tube into the cavity of the uterus. In pathological circumstances the ovum may become implanted in situations other than the endometrium of the uterine body, the subsequent gestation being called ectopic. In the majority of such gestations the ovum is implanted in the Fallopian tube. More rarely, the ectopic gestation may be uterine, implantation occurring either in the interstitial portion of the tube or in an ill developed cornu of a bicornuate uterus. Again, the ovum may be implanted in the ovary leading to ovarian pregnancy, or, in very rare instances, ectopic pregnancy may be primary in the peritoneal cavity. The types of ectopic gestation can therefore be summarised under the following heads —

Extra-uterine

Ovarian
Primary abdominal
Tubal

Uterine

Interstitial pregnancy
Pregnancy in an accessory cornu

Ætiology Ectopic gestation is determined by faulty implantation and the cause may be either in the ovum itself or in the maternal structures. The commonest cause of ectopic gestation is undoubtedly previous inflammation of the uterine adnexa. In catarrhal salpingitis the epithelial cells of the plicæ become desquamated into the lumen of the tube and in the process of healing, adjacent plicæ adhere and form blind alleys in the tube, in which a migrating ovum may be held up in its passage towards the uterus. At operation, in ectopic gestation, it is extremely

common to find membranous adhesions around the unaffected Fallopian tube, and there may be difficulty because of adhesions in delivering the tubal gestation from the pelvis. Again, it is well known clinically that ectopic gestation often arises in women who have been sterile for several years, and if a careful history is taken, some record may be obtained either of previous gonococcal salpingitis or salpingitis following upon septic abortion or puerperal sepsis. Ectopic gestation is much more frequent in densely populated areas and in seaport towns, and its incidence was high during the post war era.

Although previous inflammatory lesions of the uterine adnexa are responsible for the majority of cases of ectopic gestation other causes must be recognised. Among them are congenital defects of the Fallopian tube, such as accessory ostia, congenital diverticula, and partial stenosis. The infantile type of Fallopian tube, in which the tube is relatively longer and more sinuous, may also predispose to ectopic gestation. In other cases, the ovum may migrate transperitoneally from the ovary of one side to the Fallopian tube of the other, and become implanted ectopically in the Fallopian tube. Probably such cases are not uncommon, for it is not unusual to find the corpus luteum of pregnancy in one ovary with an ectopic gestation in the opposite Fallopian tube. Ectopic gestation has also been attributed to such pelvic abnormalities as fundal myomata and adenomyoma of the Fallopian tube, and cases arise from time to time after operations for ventrisuspension of the uterus.

In some cases of ectopic gestation it is probable that the ovum itself is at fault. It is possible, theoretically, that a rapid development of the trophoblast might lead to early implantation in the Fallopian tube, just as late implantation, owing to slow development of the trophoblast, would lead to placenta prævia. Such a hypothesis explains those cases of ectopic gestation in which there is no evidence of maternal abnormality. Moreover, there is histological evidence that the trophoblast is usually particularly well developed in such cases. Again, it is well established clinically that ectopic gestation sometimes develops when coitus is difficult.

In most cases of ectopic gestation the cause can be attributed to previous inflammation of the Fallopian tube. The other cases, where no such lesions can be demonstrated, are usually difficult to account for, except by postulating some inherent defect in the ovum or perhaps some abnormality in fertilisation.

Pathological Anatomy

Ovarian Pregnancy A large number of cases of ovarian pregnancy have now been recorded, but it is exceptional for the specimens to show the exact relations of the ovum to the ovarian tissues. In most cases the ovum is fertilised before it is shed from the follicle, so that the site of implantation is the cavity of the corpus luteum of pregnancy. Ovarian pregnancies are always characterised by large hæmatomata surrounding the ovum. Decidual reaction in the ovary is relatively scanty



FIG 102 Ectopic gestation. The uterus lies to the right. The gestation sac full of blood formed in the isthmus portion of the Fallopian tube. The ovary lies below the gestation sac.

except on the surface of the cortex. As a result ovarian pregnancy produces the appearance of a large ovarian hæmatoma, foetal and trophoblastic tissues being identified histologically, so that the diagnosis is only established after microscopical examination.

Primary Abdominal Pregnancy Such cases are very rare, and little is known of the method of implantation. It is more than probable that the ovum is implanted in areas of ectopic decidua.

Tubal Pregnancy In tubal pregnancy the most frequent implantation site is the ampulla perhaps because the plicæ are

most numerous in this situation, so that previous salpingitis is more likely to produce crypts here than elsewhere along the Fallopian tube. The attachment of the ovum must necessarily be eccentric, and much depends, so far as the patient is concerned, upon whether the ovum is primarily attached on the cranial or caudal side of the tube, for the placenta becomes differentiated adjacent to the side of implantation. If attached cranially, the trophoblast may eventually erode through the peritoneal surface

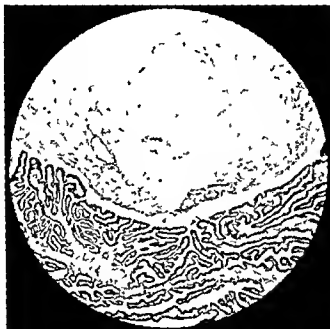


FIG. 103. Ectopic gestation. Tubal mole. In the lower part of the photograph are normal plicæ without decidual reaction. In the lumen of the tube is altered blood clot, together with degenerate chorionic villi.

of the tube and lead to intraperitoneal hæmorrhage, while with a caudal attachment, erosion of the trophoblast, though usually causing hæmorrhage into the lumen of the tube, may lead to the formation of a broad ligament hæmatoma.

The decidual reaction of the tissues of the plicæ of the tube is both scanty and incomplete. Moreover, the muscle wall of the tube is thin, and there is therefore little resistance to the eroding action of the trophoblast of the embedded ovum. Just as in normal intra-uterine pregnancy maternal vessels are opened up by the developing trophoblast, so with ectopic gestation

the broad ligament, a broad ligament hæmatoma forms, which may strip up the peritoneum and extend upwards above the pelvic brim

Fate of the Ovum

In the majority of cases the hæmorrhages which are produced around the ovum separate the chorionic villi from their attachment, so that the ovum is forcibly dislodged either into the lumen of the tube, or, in cases of tubal rupture, into the peritoneal cavity. In other cases, the ovum, though not completely dislodged from the tube, may be separated to a degree sufficient to deprive it of its nutrition, so that it dies and forms a tubal mole.

On rare occasions the dislodgment may be partial with no separation of the placenta from the decidua basalis, so that the ovum continues to develop. Two types of case can be recognised. In the first group, the placenta is attached to the caudal aspect of the tube, adjacent to the broad ligament, so that the ovum grows cranially. In almost all cases the cranial surface of the gestation sac bursts through the tube, at first becoming surrounded by blood clot, and later forming adhesions to the omentum and intestine. In the second group, the attachment of the placenta is to the cranial aspect of the tube, and the ovum grows downwards in the broad ligament, although the placental attachment, though primary to the tube, becomes fixed to the omentum and intestine by adhesions. Such gestations are sometimes referred to as secondary abdominal, or broad ligament, pregnancy. The subsequent fate of such secondary pregnancies is variable. There is always a danger of further internal hæmorrhage from erosion of maternal vessels, or the placenta may become detached and the foetus deprived of its nutrition, so that the ovum dies. In other cases the pregnancy may proceed to term, when the patient experiences a spurious labour, during which there is again further risk of severe internal bleeding. If the patient survives these complications, the foetus dies and may remain inside the abdomen for many years, undergoing mummification and calcification, and become a lithopædion. A lithopædion may be retained for many years, cases having been recorded of retention for more than fifty years without causing complications. In other cases the gestation sac may adhere to the abdominal wall or bowel and become infected, so that pieces of lithopædion are periodically discharged.

It was shown by Gordon Ley that the fetuses of secondary abdominal pregnancies are very often maldeveloped, which may be attributed to the disturbances to their nutrition and the pressures to which they are subjected in the early stages of development.

Secondary abdominal pregnancy and lithopædion formation should, however, be regarded as extremely rare sequelæ of ectopic gestation.

Interstitial Pregnancy. Interstitial pregnancy is a very rare form of ectopic gestation, the ovum being implanted in the



FIG. 103. Ectopic gestation Cornual pregnancy. On the extreme right lies the gestation sac containing a three months' fetus and the placenta. The pregnancy developed in a rudimentary horn. The uterus and opposite ovary and tube lie on the extreme left.

interstitial portion of the tube. Usually a muscular septum intervenes between the gestation sac and the cavity of the uterus, and the ovum gradually erodes through to the peritoneal surface of the uterus. Interstitial pregnancy usually terminates by rupture into the peritoneal cavity during the third month of pregnancy, but during the period of gestation the distension of the muscle wall of the uterus causes severe abdominal pain, and the tenderness found during bimanual examination of the uterus may lead to the uterus being removed through the mistaken diagnosis of a degenerate myoma.

Pregnancy in an Accessory Cornu. The fate of a pregnancy in a duplicated uterus depends upon the degree of development

of the cornu. In uterus didelphys, or when both cornua are well developed, pregnancy usually proceeds normally to term, and parturition may be normal. If the cornu is ill developed, the muscle wall becomes thinned out and may rupture during the pregnancy. This complication usually develops during the fourth month and causes extremely severe internal bleeding. At operation the type of gestation is recognised from the position of attachment of the round ligament, which passes from the lateral end of the gestation sac to the internal abdominal ring whereas, in isthmus pregnancy, the round ligament lies internal to the gestation sac. Cases have been recorded of pregnancy in an accessory cornu when the corpus luteum has been present in the opposite ovary, with the accessory cornu shut off from the cavity of the uterus. These cases are explained by trans peritoneal migration of the fertilised ovum.

Multiple Pregnancy and Ectopic Gestation The association of multiple pregnancy with ectopic gestation is not uncommon. A tubal gestation is quite often a twin pregnancy. Coincident intra uterine and extra uterine gestation have also been described and authentic cases of bilateral tubal pregnancy have been recorded. It is not unusual, however, in cases of ectopic gestation for the opposite Fallopian tube to be distended with blood by regurgitation from the cavity of the uterus into a tube, the abdominal ostium of which is closed by adhesions from previous salpingitis. The diagnosis of bilateral tubal pregnancy must not be made, however, unless chorionic villi can be demonstrated in both tubes.

Another important feature of tubal gestation is the frequency with which a subsequent ectopic gestation develops in the opposite tube. Statistics show that in 5 per cent. of cases of ectopic gestation a tubal gestation develops at a later date in the remaining Fallopian tube.

Symptoms and Diagnosis

The clinical picture in ectopic gestation varies with the type of case. With tubal rupture the picture is one of an abdominal catastrophe associated with internal bleeding, and such cases are of the greatest urgency. With tubal mole, and peri and para tubal hæmatocœles, the urgency is not so great, and the patient complains of abdominal pain and irregular vaginal bleeding.

Symptoms History of Pregnancy In typical cases of ectopic gestation the patient gives a history of a missed period,

and states that between six and eight weeks from the first day of the last period vaginal bleeding has developed. If amenorrhœa has lasted for six weeks or more, the symptoms of early pregnancy, such as morning vomiting, frequency of micturition, tenderness and fullness of the breasts, may be noted. Such symptoms, however, are not always present if the ectopic gestation ruptures in the early weeks. In many cases of ectopic gestation a history of amenorrhœa cannot be obtained. Probably the gestation sac is dislodged soon after implantation, the hormonal influences of pregnancy are disturbed, and the uterine decidua is early dislodged. With secondary abdominal pregnancy, except for this hæmorrhage developing at the time of the erosion of the Fallopian tube, amenorrhœa continues until the ovum dies, or the pregnancy reaches term.

Pain The most constant feature of all cases of ectopic gestation is the development of abdominal pain. The pain is always severe, much more so than with any form of abortion of an intra uterine pregnancy. The most severe cases are those of tubal rupture, when the wall of the Fallopian tube bursts and a large quantity of blood is rapidly discharged into the peritoneal cavity. With tubal mole, tubal abortion, and tubal erosion, the pain is sometimes colicky, and always severe, so that the patient has to give up her work. There is usually nausea, vomiting, and sometimes syncope. It must be emphasised that ectopic gestation always causes severe abdominal pain, comparable to that of appendicitis, while with tubal rupture associated with diffuse intraperitoneal bleeding, the pain, the collapse, and the shock are comparable to those found with a perforated gastric ulcer. The diagnosis of ectopic gestation, in which localised hæmatomata are formed, often presents an extremely difficult clinical problem, and a careful interrogation of the patient as to the severity of the pain is always necessary.

Vaginal Bleeding The vaginal bleeding in ectopic gestation is of a peculiar type, for it consists either of dark altered and fluid blood, or of dark coagulated material. Severe vaginal bleeding is hardly ever seen, and it is very exceptional for clots to be passed. The vaginal hæmorrhage originates in most cases in the endometrium of the uterus, although some of the blood may be discharged from the Fallopian tube through the uterus into the vagina. With ectopic gestation, the endometrium of the uterus usually hypertrophies and becomes converted into a decidua, which is macroscopically and histologically identical

with the decidua of early pregnancy. It has recently been shown however, that a decidual reaction in the uterus is not invariable with ectopic gestation. When the ovum dies as the result of its dislodgment by hæmorrhage, retrogressive changes arise in the endometrium which at first take the form of hæmorrhage into the spongy layer. Sometimes the whole of the uterine decidua separates from the uterus and is discharged as a decidual cast of the uterine cavity into the vagina. Decidual casts have smooth glistening inner surfaces, the maternal surface being shaggy. The passage of a decidual cast is pathognomonic of ectopic gestation. Histological examination of a decidual cast demonstrates the presence of decidual cells and hypertrophied glands, chorionic villi being absent. When the endometrium disintegrates without exfoliation of its superficial layers to produce a cast the altered blood is discharged from the uterus and in many ways resembles the menstrual discharge. One of the great characteristics of the vaginal bleeding in ectopic gestation is that it is prolonged. Indeed if a woman in the childbearing period of life develops vaginal bleeding somewhere about the time a period is due and if this bleeding persists the case should be suspected of ectopic gestation. It is not unusual to see patients in whom the hæmorrhage has lasted for as long as two or three months whose main complaint is persistent bleeding and for whom the abdominal pain was shortlived and almost forgotten.

Women suspected of having ectopic gestation should be carefully interrogated as to whether solid material has been discharged from the uterus. One of the difficulties in the diagnosis of ectopic gestation is to distinguish between pyosalpinx following upon septic abortion and ectopic gestation. Women often attempt to conceal that they have aborted, particularly if the abortion has been procured illegally.

If an ectopic gestation ruptures, and a large quantity of blood is rapidly discharged into the peritoneal cavity, the woman immediately becomes collapsed and shocked. Such patients are usually desperately ill with subnormal temperature and rapid pulse. They usually give a clear cut history of a missed period and of violent abdominal pain at the time of the collapse and shock. One of the most striking features of patients with severe internal hæmorrhage is the clear headedness they display. Although desperately ill and shocked they may still ask intelligent questions about their condition and take an active interest

to the preparations made for operation. The vaginal bleeding may develop subsequent to the abdominal pain and shock.

Physical Signs The physical signs vary according to whether the patient is suffering from acute intraperitoneal hæmorrhage or whether local hæmatomata have been formed in the pelvis.

With Diffuse Internal Bleeding The appearance of the patient is characteristic. She has a real pallor, easily distinguishable from the greyiness of shock, and the two other symptoms of internal hæmorrhage, restlessness and air hunger, may both be present. Superimposed upon the features of internal hæmorrhage are those of collapse and shock, so that the patient is cold, the skin is clammy, the temperature subnormal, and the pulse thin and running. The degree of anæmia can be roughly determined by inspecting the conjunctivæ, the tongue and the lobe of the ear. Examination of the breasts shows a mild degree of mammary activity, such as dilated veins on the surface, hypertrophy of the lobules, and clear secretion may be expressed. The breast signs are important, but they may not be detected without great experience. The abdomen is usually slightly distended and movements may be impaired. On palpation there is extreme tenderness in the hypogastrium but rigidity is never well marked. Signs of free fluid in the abdomen are usually indefinite, even if large quantities of blood are present within the abdominal cavity. On vaginal examination the cervix is found softened, but blue discoloration of the vagina is usually absent at this early stage of gestation. In most cases there is some degree of uterine bleeding, although this may not develop until some hours after rupture. The abdominal tenderness may prevent an accurate bimanual examination of the uterus, but if the uterus can be felt it is found to be slightly enlarged and softened. In typical cases of tubal rupture with diffuse intraperitoneal bleeding, it is exceptional to find clearly defined swellings in the pelvis apart from the uterus. Usually only a tender resistance in Douglas's pouch can be felt. In other cases, however, when the ovum still remains in the Fallopian tube, a firm rounded swelling can be palpated in this situation.

The diagnosis of tubal rupture with diffuse intraperitoneal bleeding is from such intra abdominal catastrophes as perforated gastric or duodenal ulcer, perforated appendix with general peritonitis, perforated gall bladder, or such rare conditions as ruptured spleen and acute pancreatitis. The main points in establishing the diagnosis are the history of a missed

period the signs of activity in the breasts, and the evidence of internal bleeding. Again, the short history, combined with subnormal temperature and shock, serve to exclude appendicitis and inflammatory lesions within the abdominal cavity.

The diagnosis may be much more difficult with ruptured secondary abdominal pregnancy, for in the differential diagnosis ruptured uterus and concealed accidental hæmorrhage have to be considered.

Localised Intraperitoneal Hæmorrhage In this type of case, although there may be some degree of constitutional disturbance as a result of the local intraperitoneal bleeding the dominant features of the case are recurrent abdominal pain and vaginal bleeding. Examination of the patient may show a minor degree of anæmia. The pulse rate is raised in proportion to the severity of the case, but it is exceptional for the temperature to be raised more than 99.4° . The absence of severe pyrexia may be of great service in distinguishing between ectopic gestation and pyosalpinx. The breasts show signs of early activity. On examination of the abdomen, tenderness in one or other iliac fossa is invariable, and in some cases the hæmatoma can be palpated arising from the pelvis as a tender, firm swelling. Distension and rigidity are not characteristic of a case of this kind.

The most important physical signs, however, are found on vaginal examination, for an accurate bimanual examination is usually possible. The peculiar uterine hæmorrhage can be recognised, the cervix is found to be softened and the uterus slightly enlarged. The other physical signs vary with the type of case. With pelvic hæmatocoele an irregular swelling can be felt through the posterior fornix in the pouch of Douglas. It has a peculiar consistence, which is almost pathognomonic, for it has no definite outline, is neither fluid nor solid and its consistence varies in different areas. Occasionally the hæmatoma is extremely tender. It pushes the uterus forwards and upwards, and on rare occasions produces retention of urine. Very occasionally it may extend upwards in the abdomen to be palpated on abdominal examination. Tubal mole and the hæmatosalpinx of intratubal hæmorrhage form retort shaped swellings which are tense, firm, and smooth, and which push the uterus to the opposite side of the pelvis. Peritubal hæmatocoeles form firm hard swellings which may be mistaken for subperitoneal myomata. Firmness, tenderness, and smoothness are characteristic of the localised hæmatomata of this form.

of ectopic gestation With physical signs of this kind there is often great difficulty in distinguishing between ectopic gestation and pyosalpinx With pyosalpinx the temperature is raised, and there may be a history of gonorrhœa or septic abortion A difficulty in establishing the diagnosis is that with pyosalpinx continuous vaginal bleeding is not uncommon, and if the pyosalpinx results from a septic abortion there may be a history of a missed period Similarly, difficulty may be experienced in distinguishing between a pelvic hæmatocele and a pelvic abscess A leucocyte count may be of great help in establishing the diagnosis, and a Zondek Aschheim test may be of service

- A retroflexed gravid uterus is sometimes confused with the pelvic hæmatocele of an ectopic gestation, for if the gravid uterus is retroflexed, vaginal bleeding may develop as a symptom of threatened abortion and the body of the uterus may be taken to be a pelvic hæmatocele With pelvic hæmatocele the uterus can be palpated separate and apart from the swelling in the pouch of Douglas, whereas in cases of retroflexed gravid uterus the body of the uterus cannot be identified separate from the swelling in Douglas's pouch Again, in cases of retroflexion of the gravid uterus the anterior vaginal wall is stretched, the cervix points either downwards and forwards, or directly forwards, and the swelling in Douglas's pouch is smooth and soft, with clearly defined margins With pelvic hæmatocele, the cervix points directly downwards, although it may be displaced forwards and upwards The two conditions are easily distinguished if the two possibilities are borne in mind and the patient investigated with proper care

Other gynæcological conditions which may be confused with ectopic gestation are chocolate cyst and, very rarely, a small twisted ovarian cyst, for in both these conditions there may be some disturbance of menstruation Other cases present exceptional difficulty The early stages of an abortion in early intra uterine pregnancy, associated with a subperitoneal fibroid, may give a picture closely resembling that of ectopic gestation Similarly, a threatened abortion associated with a corpus luteum cyst may be hard to distinguish from ectopic gestation. It has already been emphasised, however, that with ectopic gestation extremely severe abdominal pain is the rule, and such severe pain is not to be expected during the abortion of an intra-uterine pregnancy.

Clinical experience shows that the diagnosis of ectopic gestation often presents very great difficulty, and many cases are missed because ectopic gestation is not suspected. Women who during the child bearing period of life complain of severe pain in the lower abdomen associated with continuous vaginal bleeding should be suspected of ectopic gestation. It is far better to treat pyosalpinx by abdominal operation than to treat an ectopic gestation conservatively with tampons and douches.

Treatment All cases of ectopic gestation must be operated upon when once the diagnosis has been made. Treatment consists in abdominal operation but the technique differs according to whether the case is associated with diffuse intraperitoneal bleeding or whether the hæmorrhages are localised in the pelvis.

It is very exceptional for the diagnosis of ectopic gestation to be made prior to rupture or the production of some form of pelvic hæmatoma. Such cases should be treated by excision of the affected Fallopian tube.

With diffuse intraperitoneal bleeding immediate operation is necessary. Although such patients may be desperately ill the operation results are extremely good. It is probable that a great deal of the shock and collapse from which such patients suffer is caused by the blood which is pent up in the peritoneal cavity. Experience shows that patients at once improve as soon as the peritoneal cavity is opened and the blood evacuated. Pre-operative treatment should be of the simplest but care must be taken to shave the pubic hair and disinfect the abdominal wall. A mixture of gas oxygen and ether is the best anæsthetic to use for the ether acts as a stimulant. The abdomen is opened by a midline sub umbilical incision the patient if well enough, being placed in the Trendelenberg position. A hand is passed down into the pelvis the affected Fallopian tube drawn out of the wound clamps placed on the mesosalpinx and the tube excised. The pedicles are tied with catgut and the stump is allowed to fall back into the pelvis. With tubal rupture owing to adhesions around the tube there may be difficulty in delivering the Fallopian tube from the wound and in some cases where adhesions are present, it may be necessary to remove the ovary as well. Another difficulty is that the opposite Fallopian tube may be converted into a hæmatosalpinx and the operator may have to spend some time in deciding which of the tubes contains the ectopic gestation. Blood clot and as much blood

as is possible are removed from the peritoneal cavity and a pint of saline, at a temperature of 105° F, is then poured into the peritoneal cavity. Finally, the abdominal wound is sutured in layers in the ordinary way. The operation can be performed quite quickly, within a few minutes. It should always be undertaken, however desperate the patient's condition may be. Experience shows that the patients improve as soon as the peritoneal cavity is opened and very little anæsthetic is required to allow this to be done. There is, therefore, very little risk of the patient dying under anæsthesia. Immediately after operation the patient is treated by blood transfusion or saline infusion. The foot of the bed is raised, and the patient warmed by an electric blanket. Recovery is usually rapid and uneventful. Some degree of pyrexia is almost the rule during the first week after operation, probably because of the absorption of blood from the peritoneal cavity. If large clots are left in the pelvis they sometimes suppurate and the pelvis has to be drained at a later date. If the abscess points in the pouch of Douglas it should be emptied by posterior colpotomy.

In the other forms of ectopic gestation there is not the same urgency and a patient can be prepared in the routine way for an abdominal operation. The earlier the case is operated upon, however, the better, for there is always a risk of a living ovum causing tubal rupture with diffuse intraperitoneal bleeding. Moreover, long standing blood clot in the peritoneal cavity may be difficult to remove because it becomes adherent to adjacent structures. The risk of a hæmatocele becoming infected is extremely small, although this complication was known when abdominal operations were not performed so frequently as now. The principles of treatment are, as with ruptured ectopic with diffuse intraperitoneal bleeding, to remove the affected tube and blood clot. Tubal moles, peritubal and paratubal hæmatoceles, are easily delivered from the pelvis, and the affected tube can usually be removed without difficulty. In such cases, however, the ovary may be firmly adherent to the tube, and it may not be possible to excise the tube without removing the ovary as well. Old standing pelvic hæmatoceles may be difficult to remove because of adhesions, and great care must be taken to avoid damage to the intestine, because of the risk of severe sepsis, which usually takes the form of spreading peritonitis.

The treatment of secondary abdominal pregnancy depends upon the stage of gestation reached when the diagnosis is made.

No useful purpose is served in thinking of the foetus, for malformations are very common and few children survive. If the ovum has died and been retained for any length of time, the gestation sac should be removed entire. There may be difficulty, however, in separating the placenta from its attachment to the abdominal viscera.

If the foetus is alive, although its removal from the gestation sac can be accomplished without difficulty, the separation of the placenta may lead to extremely severe hæmorrhage, which may be uncontrollable. If, therefore, the attachment of the placenta is such that large vessels will be opened up if it is removed, it is better to marsupialise the sac and leave the placenta within the abdomen. In clean cases this can be removed by a second abdominal operation about three weeks later. If, however, suppuration develops in the gestation sac, further interference is contra indicated and in time the placenta becomes absorbed partly by autolysis and partly by disintegration through sepsis and is discharged through the abdominal sinus.

CHAPTER XV

DISORDERS OF MENSTRUATION

In healthy women menstruation begins at about the age of fourteen and persists throughout the child bearing period of life, with a rhythm of twenty eight days and a duration of between three to five days. It is common, however, for departures from this normal sequence to be seen in women who have no disturbance in health. Puberty may be delayed in girls who pursue strenuous activities, and with the peasant girls of the Balkan States the onset of menstruation is often delayed until the age of 20. Again, the cycle of twenty eight days is by no means invariable in healthy women, for frequently there is a departure of one or two days from the twenty eight day cycle without disturbance of health or association with general disease. Minor departures from what is regarded as the physiological menstrual cycle should not therefore be regarded as pathological.

Disorders of menstruation are, however, extremely common and account for the complaints of a large proportion of gynæcological patients. Such menstrual disturbances are symptomatic and very often the primary cause is indeterminate. It is customary, therefore, to group the cases symptomatically, and although the method of classification is theoretically unsound, it is the most practical that is possible from the clinical point of view.

Amenorrhœa

Physiological amenorrhœa occurs during pregnancy and lactation, and after the menopause. The other types of amenorrhœa should be regarded as pathological.

Delayed Onset of Puberty In one group the onset of puberty is delayed. The cases of *cryptomenorrhœa* which have already been described in Chapter V, in which the hymen is imperforate, belong to this group. The commonest cases are those associated with ill development of the uterus and ovaries. With extreme degrees of ill development, such as a fœtal type

of uterus, or non-development of the ovaries and uterus, or non-development of the vagina, menstruation is impossible. At the other extreme, are the very frequent cases of minor degrees of hypoplasia genitalis, when puberty is delayed until the age of 16 or 17. Between these two extremes all varieties are seen. The secondary sexual characters develop normally, and, apart from a tendency to adiposity, there may be no general disturbance. In the majority of such cases the primary fault is probably an ovarian hypoplasia, but this supposition is purely theoretical. In other cases of delayed onset of puberty some general disturbances may be recognised, and the most interesting are those caused by defects of the ductless glands, illustrated by dystrophia adiposo genitalis and cretinism. Other general disturbances, such as diabetes, tuberculosis, or anæmia, may also be responsible for the delayed onset, perhaps because the body metabolism is fully occupied with dealing with the general disease and insufficient stimulus is given to the ovaries to induce the processes leading to menstruation.

Cases of delayed onset of puberty must be investigated with care, for it is often of great importance to give an accurate prognosis. General diseases and disorders of the endocrine system must first be excluded, and then the patient should be examined to determine how far the secondary sex characters are developed. There is a rare group of cases in which the secondary sex characters fail to develop altogether, and the uterus is of the foetal type. In such cases the cause is probably a primary ovarian hypoplasia combined with insufficiency of the suprarenal cortex, and the prognosis, so far as menstruation is concerned, is hopeless. A rectal examination of the pelvis should be made to determine the size of the uterus and also if possible the size of the ovaries and the presence of ovarian tenderness. If the uterus is well developed and the ovaries are palpable a good prognosis can be given, for it is very exceptional to see patients in the third decade of life who have never menstruated. In the majority of cases the onset of menstruation is merely delayed, and in due course the patient menstruates normally. It is not uncommon for girls of the age of 19 or 20 to be brought for examination so that an opinion can be given as to whether they will be sterile after marriage. A good prognosis should be given if the genitalia are well formed and the secondary sex characters well developed.

Somewhat similar cases are those of young girls who, having menstruated normally at puberty, develop amenorrhœa at about the age of 16 or 17, the periods returning with a normal rhythm between the ages of 21 and 22. With such patients there is usually some primary genital hypoplasia, and possibly as the result of environmental change, strenuous work, or acute illness, the body metabolism is reduced so that amenorrhœa develops.

Treatment of delayed onset of puberty caused by genital hypoplasia should follow general lines. Fresh air, games, gymnastics, and exercises, should be encouraged. Iron, arsenic, and aloes, are the standard drugs to be given. Hypothyroidism should be treated by the oral administration of thyroid. At the present day, it is customary to treat patients suffering from delayed onset of puberty with œstrin. The simplest method is to give stilbœstrol or one of the synthetic œstrogens by mouth. The dosage will depend upon the response to treatment and upon whether the patient develops toxic symptoms. Unless there is gross congenital hypoplasia, maldevelopment or a polyglandular disturbance, the response to treatment is usually extremely good.

The usual method of classifying pathological amenorrhœa is to group the cases into those which are primary, where menstruation has never developed, and those which are secondary, where menstruation ceases, having previously been normal. Clinical experience shows that patients with a delayed onset of puberty are more frequently seen and more important than the very rare patients who are seen relatively late in life with primary amenorrhœa in whom menstruation has never developed. The rare conditions of dystrophia adiposo-genitalis, genital infantilism, and such errors as failure of development of the uterus and vagina illustrate the forms of primary absolute amenorrhœa.

➤ Secondary Amenorrhœa. Secondary amenorrhœa follows upon the surgical removal of the uterus or both ovaries and it results from the creation of an artificial menopause by radiological means. It is very exceptional for amenorrhœa to be caused by inflammatory lesions of the uterine adnexa; probably the only authentic cases are those where there is advanced tuberculosis of the uterine appendages. Similarly it is unusual for ovarian tumours to cause amenorrhœa, women with enormous ovarian tumours often menstruating regularly. Malignant

results are obtained from the use of oestrin alone. Doses of 5 mgm stilboestrol daily are required for the average case. The use of synthetic oestrogens has largely replaced the injection of the natural oestrogens. Larger doses must be used when the condition is refractory. Progestin is also necessary in severe cases. The anterior pituitary like hormones are not regarded as so useful in this type of case, although opinion on the use of large doses of this hormone must be suspended until larger doses are available for clinical trial (see p. 352).

The prognosis with secondary amenorrhœa of the pathological type depends upon the primary cause. In cases of ovarian deficiency, the prognosis is good, although recurrences are very apt to develop, but with polyglandular deficiency the prognosis is bad.

Hypomenorrhœa

In hypomenorrhœa the menstrual cycle is prolonged and often irregular. In the average case the menstrual cycle is of the order of five to six weeks. With hypoplasia genitalis hypomenorrhœa is a common symptom at the onset of puberty, the menstrual cycle often being prolonged to six months or more. Hypomenorrhœa is usually associated with a scanty loss, but dysmenorrhœa, though sometimes associated, is by no means invariable. Hypomenorrhœa must be regarded as a form of ovarian dysfunction and Ogino has shown that ovulation is delayed, although the interval between ovulation and menstruation is always fourteen days. It is possible, however, that Ogino's findings do not hold for all cases, although it is now established that some form of ovarian dysfunction constitutes the basis of hypomenorrhœa. It is clear that hypomenorrhœa differs very little from secondary amenorrhœa caused by ovarian deficiency. The patients are usually of the same type, and the investigation, treatment and prognosis correspond.

Oligomenorrhœa

With oligomenorrhœa the menstrual cycle is unaltered, but the duration of the bleeding and the amount of blood lost are less than normal. In most cases the uterus is found to be all developed, although the secondary sex characters are normal. The exact etiology of oligomenorrhœa is not established. Theoretically, it might be caused by progestin deficiency, which would lead to secretory hypertrophy of the endometrium being

ill-developed, so that less endometrium would be disintegrated during menstruation and the menstrual hæmorrhage would be less than usual. Oligomenorrhœa is a characteristic symptom of the approach of the menopause. It also develops in the early stages of polyglandular endocrine deficiency. Of itself, oligomenorrhœa does not call for treatment; if developing during the child-bearing period of life it is suggestive of some ductless gland disturbance.

Dysmenorrhœa

Dysmenorrhœa, or painful menstruation, is one of the most frequent of gynæcological complaints, and there is reason to believe that its incidence becomes higher with the degree of civilisation of the community. Severe dysmenorrhœa is most prevalent in young single women leading sedentary lives, and its frequency has some economic importance, for the patients are often incapacitated from work for one or more days during each period. Although dysmenorrhœa should not be regarded as a serious affection, its treatment is of great importance to the practising physician in view of the interruption in the patient's economic and social life, not to mention the important psychological effects.

The usual method of classifying the different types of dysmenorrhœa is to identify three groups:—

- ✓ Congestive.
- ✓ Spasmodic.
- ✓ Membranous.

Congestive Dysmenorrhœa. This takes the form of premenstrual pain situated either in the back or lower abdomen, arising between three and five days prior to the onset of menstruation and being relieved by the menstrual flow. Congestive dysmenorrhœa should be regarded as a concomitant symptom of pelvic disease, and if the typical history is obtained some pelvic abnormality will be found. Inflammatory diseases such as salpingo-oöphoritis, parametritis, and pelvic adhesions, almost always produce the symptom of congestive dysmenorrhœa, probably because the ovaries are hyperæmic and covered by adhesions from the inflammatory lesions, so that they become tense during the premenstrual phase of the menstrual cycle. Congestive dysmenorrhœa is a common symptom of large myomata, of chocolate cysts of the ovaries, and of adenomyomata.—

Spasmodic Dysmenorrhœa The majority of cases of dysmenorrhœa fall into this group. With congestive dysmenorrhœa the symptom is masked by others which are more prominent in the disease. For example with inflammatory pelvic lesions discharge, abdominal pain, and menorrhagia are more dominating symptoms than congestive dysmenorrhœa. It can, therefore, be taken as an acting principle that if a patient's main complaint is dysmenorrhœa the dysmenorrhœa is of the spasmodic type. In typical cases the patient's history is very characteristic. The pain develops on the first day of the menstrual period when excruciating pain is experienced which lasts for a relatively short time perhaps for half an hour to an hour. This very severe pain is intermittent and spasmodic, and may cause faintness collapse vomiting or nausea. A mild degree of shock may follow upon a very severe attack. The severe attack of pain is followed by a similar but less pronounced type of pain felt in the lower abdomen and pelvis, and often down the thighs. Such pain always persists throughout the first day, but diminishes as the period proceeds.

It is important to realise that there is much variation in the type of pain experienced by patients with spasmodic dysmenorrhœa. Sometimes severe pain starts on the day prior to the menstrual flow while in rare cases the excruciating pain may arise during the second day of the period. Similarly, premenstrual pain may be complained of either in the back or lower abdomen which leads up to the excruciating pain felt on the first day of the period. It is wrong however to regard such cases as being of the congestive dysmenorrhœa type. They represent variations of the spasmodic dysmenorrhœa group of cases. The severity of the pain varies greatly. Sometimes it is appallingly severe, causing well marked shock and incapacitating the woman from her employment. The best method of determining the severity of the pain is to enquire as to the symptoms of faintness vomiting and the degree to which the patient is incapacitated.

In typical cases spasmodic dysmenorrhœa arises at puberty, severe pain being experienced as soon as the girl starts to menstruate. But this rule is by no means invariable and there is a well defined group of cases where menstruation is painless until about the age of 18 or 19 when very severe pain develops. Probably the most severe forms are seen in patients between the ages of 10 and 21. It is rare to see cases of severe spasmodic

dysmenorrhœa in women over the age of 35. For some reason dysmenorrhœa becomes less severe at about that time, and it is exceptional for the excruciating pain to persist until that age, although the less severe pain lasting during the first day of the period usually persists until the woman approaches menopausal age.

Spasmodic dysmenorrhœa is usually cured by pregnancy, and exceptions to this rule are infrequent. A woman who has only one child is more likely to develop a recurrence of spasmodic dysmenorrhœa than a woman who gives birth to several children. Again, dysmenorrhœa is often cured by marriage, and almost all married women will say that they have not suffered so much from dysmenorrhœa since marriage.

Some degree of menstrual irregularity is not uncommon with spasmodic dysmenorrhœa. Sometimes the onset of puberty is delayed, and sometimes the menstrual cycle is a little irregular or prolonged. In spasmodic dysmenorrhœa the amount lost



FIG. 106. A uterine sound.

during each period is less than the average, and not infrequently patients give a history that the severe pain is relieved by the passage of a clot. It is not without interest that patients who are sterile do not usually give a history of spasmodic dysmenorrhœa—

Ætiology

The exact ætiology of spasmodic dysmenorrhœa is unknown. Presumably, if women married shortly after puberty and had a succession of pregnancies throughout the childbearing period of life spasmodic dysmenorrhœa would be extremely rare. A variety of theories have been suggested, but they are not convincing and do not withstand critical analysis. It is customary to group the causes into (1) Disorders of Structure and (2) Disorders of Function.

Disorders of Structure ¹⁹ Ill Development of the Uterus. The uterus is almost always found to be ill-developed with severe dysmenorrhœa. Normally, at puberty, the body of the uterus hypertrophies so that it becomes much longer than the cervix,

but the prepubescent type of uterus may persist, when the patient is almost certain to develop dysmenorrhœa. If the uterus retains its infantile form, the menstrual periods are either extremely scanty, or the woman has amenorrhœa. If the uterus is ill developed to such a degree that it retains the foetal form, menstruation is impossible. In most cases of dysmenorrhœa the uterus is found to be ill developed, with its body smaller than the normal uterus. Not infrequently the cervix is hypoplastic, being slender and conical with the external os small. Some degree of hypoplasia of the vagina is not uncommon, so that the vagina is conical and the fornices are narrow. The ill development of the uterus is best and most strikingly recognised during the operation of dilatation of the cervix. The uterine sound passes for only a short distance, and the cervical canal may be so small that a sound is passed only with extreme difficulty. Moreover, dilatation of the cervix with metal dilators is extremely difficult unless the operation is performed very slowly.

1) *Maldevelopment*. If the uterus is bicornuate or septate, or if an accessory cornu is present, severe spasmodic dysmenorrhœa is fairly frequent.

2) *Multiposition*. A common finding with spasmodic dysmenorrhœa is acute antelexion of the uterus—the so called cocked uterus. With congenital retroflexion of the uterus spasmodic dysmenorrhœa is a common symptom. In some cases the whole uterus is displaced laterally to the left of the mid line.

3) *Myohypoplasia of the Myometrium*. With ill development of the body of the uterus the plain muscle content of the myometrium is less than normal. It has been suggested that such an ill developed uterus is lacking in contractile power, so that the menstrual fluid, instead of being forced through the cervical canal becomes pent up in the body of the uterus and by distension induces the characteristic pain.

Disorders of Function 1) *Deficient Polarity*. When the body of the uterus contracts the cervix normally dilates, and conversely, when the cervix is forcibly dilated, as for example, as a result of introduction of laminaria tents into the cervical canal the body of the uterus contracts. The term polarity is applied to this association between contractions of the body of the uterus and dilatation of the cervix. It has been suggested that the polarity of the uterus is disturbed with spasmodic dysmenorrhœa, so that there is difficulty in the menstrual blood being discharged through the cervix.

1) *Abnormalities of the Menstrual Discharge* It has been suggested that deficiency of thrombolysin causes failure of menstrual clots to become liquefied, and that the consequent passage of these clots through the cervical canal causes menstrual pain. Others maintain that the enzyme normally secreted by the endometrium during menstruation is deficient, so that the endometrium is discharged into the cavity of the uterus in the form of shreds or, in cases of membranous dysmenorrhœa, as membranes or even as casts of the endometrium. It is true that with membranous dysmenorrhœa such casts are characteristically discharged.

The most typical clinical feature of spasmodic dysmenorrhœa is its association with ill development of the uterus. The pain is probably caused by distension of the uterus, either with menstrual blood or perhaps by large hæmorrhages into the endometrium. The pain should therefore be regarded as uterine. Some authorities believe that the pain is sometimes ovarian in origin, for the pain may be more marked to one or the other side of the mid line, and often the tunica albuginea of the ovaries is sclerosed.

In cases of uterine polypi painful contractions of the uterus may be experienced during menstruation which resemble the pain experienced with spasmodic dysmenorrhœa. Again, after operations on the uterus, such as Cæsarian section, myomectomy, and amputation of the cervix, menstruation may become painful because of the scars in the wall of the uterus. In adenomyosis of the uterus, severe dysmenorrhœa is frequently complained of, and the typical history given by these patients is the development of severe dysmenorrhœa between the ages of 30 and 40. With chocolate cysts of the ovaries and pelvic endometriosis severe premenstrual pain is a common symptom, but the pain is of a different nature from that of spasmodic dysmenorrhœa.

The effects of dysmenorrhœa react considerably upon the psychology of the individual. Not only do patients suspect structural abnormalities in the pelvis, and are prone to believe that after marriage they will be unable to conceive, but they dread the onset of the next period with its accompanying pain. In time the effects of the dysmenorrhœa are exaggerated, so that while a young woman is prepared to face the menstrual pain, later in life she accepts her disabilities and will offer but little resistance to their effects.

Diagnosis

It has already been emphasised that spasmodic dysmenorrhœa not infrequently departs from the classical type. Severe pain occurring either during or about the time of a period in young women should be regarded as of the spasmodic type. A rectal examination should be made to determine whether the uterus is acutely anteflexed or whether it is congenitally retroverted. The size of the uterus should be determined as accurately as possible, for the prognosis depends to some extent upon how well the uterus is developed. As a general rule, the smaller the uterus the more severe the pain, and the less likely is the patient to respond to general treatment. Vaginal examinations should be avoided in single women. The necessary physical signs can be elicited by rectal examination.

Treatment

It has already been stated that dysmenorrhœa is usually cured by child birth, and that there is almost invariable improvement after marriage. Again, vaginal operations upon the uterus and cervix should be avoided so far as possible in young girls, for after such operations the patients may develop introspection about their pelvic organs. It follows that treatment in young women should be directed along general lines, and every effort should be made to treat the patient symptomatically rather than to adopt operative measures. Of course there are exceptions. With very severe pain the incapacitation may be so great that operations are justified even in young patients, but such cases are very rare.

General treatment is of great importance. Open air exercise, games and gymnastic exercises should be encouraged. Constipation should be treated by such purges as aloes, and anæmia treated with iron. It is always difficult to suggest means whereby the patient's attention is diverted from her menstrual functions, but much can be done by a sensible mother.

In addition to the general treatment other methods are necessary during the attack of acute pain. Young children should be put to bed during the first two days of the period. When they are older, drugs should be administered for the pain. Aspirin, phenacetin, veramon, and codeine, are the most valuable drugs to give during the pain. While it is necessary to use large doses at the onset of the severe pain, it is obvious

that repeated medication with drugs of this kind, except during the maximum intensity of the pain, is both unnecessary and dangerous. The most remarkable results are perhaps obtained by the injection of atropin at the onset of the severe pain, but the method cannot be widely employed in practice because the medical attendant cannot be available at a moment's notice. The administration of belladonna prior to and during the menstrual period does not give particularly good results. Atropin given by mouth in tablet form is, however, of great value in some cases.

In practice it is found that the results obtained from a particular drug are less pronounced with succeeding menstrual periods and it is necessary to change the analgesic every few months. Other drugs, in addition to those already mentioned, are frequently employed, particularly the different members of the barbiturate group, and the medical practitioner will usually find that there is a well marked idiosyncrasy for each particular patient. Morphia is always to be avoided, however severe the case, because of the risk of the development of morphinism. A popular remedy is alcohol, in the form of gin or whisky, and hot baths are sometimes of service. With young people the principle of treatment is to employ these temporary palliative measures until the patient is of marriageable age.

The hormone treatment of dysmenorrhœa should be regarded as unsatisfactory. There is little clinical evidence that spasmodic dysmenorrhœa responds to treatment with œstrogens. Nevertheless, the theoretical basis of œstrin therapy is scientifically sound, for it is established that œstrin causes hypertrophy of the myometrium of the uterus. Progesterone is known to inhibit uterine contractions, and for this reason it may be given in doses of 2 to 3 mgm. on each of the three days prior to the time the menstrual period is due. The results of treatment are, however, indefinite. Recently, testosterone has been used in the treatment of spasmodic dysmenorrhœa and doses of about 25 mgm. on each day during the week prior to the onset of the period are recommended.

In older patients, women above the age of 25, operative treatment is justifiable. The most important method is the operation of dilatation of the cervix.

Dilatation of the Cervix. Dilatation should be performed under anaesthesia, with the patient lying in the lithotomy

position The patient is prepared as in the ordinary way for a vaginal operation The vagina is swabbed out with ether and a Sims' speculum introduced into the vagina The cervix is drawn down by means of a volsellum forceps attached to the anterior lip of the cervix The cervix is again swabbed with ether A uterine sound is now passed into the cervical canal If the uterus is ill developed difficulty may be experienced in passing the sound In such cases it is necessary to pass a small blunt pointed probe or a very small Hegar dilator to find the direction of the uterine canal The cervix is then dilated slowly with metal Hegar dilators The dilatation must be performed slowly and gradually and at least twenty minutes should be spent in dilating the cervix until it will admit a No 12 size dilator If force is used, the cervix may split or the dilator may be pushed through the posterior surface of the uterus into the peritoneal cavity If the cervix is split there is immediate severe hæmorrhage, and if the laceration spreads laterally it may injure the uterine artery and a large broad ligament hæmatoma may result, which may in some cases burrow upwards into the perinephric region If the cervix is lacerated during the dilatation a lacerated cervix with ectropion, chronic cervicitis, and discharge may be the end result of the operation

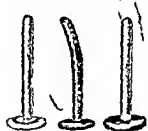


FIG 10* Intra uterine
sterns

Perforation of the uterus with a dilator is the result of carelessness and bad technique Fortunately there is little risk of peritonitis if the case is clean, and it is not necessary to perform a laparotomy The patient, however should be watched carefully during the next few days to ensure that peritonitis is not developing In practice it will be found that the dilata-

tion of the cervix is relatively simple until a dilator of about size No 11 Hegar is introduced The dilator can now be introduced only with difficulty, and during its passage the cervical tissues will usually be felt to tear If the introduction is performed slowly and carefully no harm will result It is an essential part of the operation to dilate the cervix beyond the size of No 11 Hegar and it is customary to stop at size No 14 A glass rod with a circular flange at the lower end is now passed into the cervical canal and kept in place with gauze plugged into the vagina The glass rod should be kept in situ for forty eight

hours and then removed. It is unnecessary to keep the patient in bed for more than four days after the operation, and vaginal douching is not usually necessary. The bowels should be kept confined while the glass rod remains in the uterus. Dilatation of the cervix should not be regarded as a certain cure of dysmenorrhœa, and it is important to indicate the doubtful prognosis to the patient when the operation is advised. Even when the operation is performed carefully, permanent cure is obtained only in about 25 per cent of cases. Most patients are much better for about six months after the operation, when the pain often recurs with unmitigated severity. In yet other cases little or no benefit is experienced from the operation.

A valuable method of dilatation of the cervix for dysmenorrhœa, which has fallen into disfavour during recent years, is the gradual dilatation produced by a laminaria tent. The tent should be introduced under anæsthesia after preliminary dilatation with metal dilators to admit the introduction of the tent. Curettage of the uterus is sometimes used in the treatment of dysmenorrhœa in addition to the operation of dilatation, although the scientific basis for this procedure is not quite clear.

Other Operations As the operation of dilatation of the cervix is not always a reliable method of treatment various other operations have been suggested. Among them are various plastic operations on the cervix to enlarge the cervical canal, but they are relatively unimportant and their results unreliable.

It is difficult to understand why dilatation of the cervix cures the pain in spasmodic dysmenorrhœa. The uterus may be stimulated by the operation and its muscle undergo hypertrophy, while it is obvious that a clear passage-way through the uterus to the vagina will allow the menstrual discharge to drain more efficiently than when the cervical canal is small in a hypoplastic uterus.

Presacral sympathectomy in the treatment of spasmodic dysmenorrhœa has been used fairly extensively in recent years. The abdomen is opened by a mid line incision at about the level of the umbilicus with the patient lying in the Trendelenberg position. Retractors are inserted into the wound and the intestines packed away upwards and the bifurcation of the aorta exposed. The peritoneum is incised below the bifurcation and the sympathetic nerve ganglia and nerve fibres are excised.

by dissecting the large vessels clear of fat and connective tissue, and in this way removing the sympathetic nerve fibres and ganglia. Dramatic cures are sometimes obtained by this operation, but it is clearly a severe procedure which should be adopted only in severe cases when other methods have failed. The operation seems to have no effect upon subsequent child birth.

Hysterectomy may sometimes be necessary in extreme cases, but it should clearly never be performed except as a last expedient and only after the significance of the removal of the uterus has been clearly explained to the patient.

Membranous Dysmenorrhœa Membranous dysmenorrhœa should be regarded as an extreme form of spasmodic dysmenorrhœa. The dysmenorrhœa is accompanied by the passage of membranes which frequently take the form of casts of the uterine cavity. Microscopically the casts have the structure of the endometrium during menstruation, except that the disintegrative processes are ill defined. It is most likely that the tryptic ferment secreted by the endometrium in normal menstruation is deficient. Small membranes may, however, be passed during menstruation by patients who are free from dysmenorrhœa. Inflammatory infiltration of the tissues of the casts is unknown and there is no reason to suspect that the condition is caused by a chronic inflammation of the uterus. The treatment of membranous dysmenorrhœa should follow exactly the same lines as those recommended for spasmodic dysmenorrhœa.

Menorrhagia In menorrhagia the menstrual cycle is unaltered but the duration of the period is increased. It is important to emphasise that the menstrual cycle is unaltered, for excessive bleeding associated with an irregular cycle should not be regarded as menorrhagia. Menorrhagia is essentially a symptom and not in itself a disease. The underlying cause may be difficult to detect. In past years it was customary to attribute menorrhagia to all sorts of coincident general diseases. The causes can be divided into (a) those which are local in the pelvis, (b) those caused by endocrine disorders, (c) those due to some general cause.

♂ **Local Causes** In a large number of cases menorrhagia is caused by local disease in the pelvis. Myomata afford the best example and menorrhagia can be regarded as their most characteristic symptom. Pelvic inflammation such as salpingo-

oöphoritis by inducing hyperæmia, also leads to menorrhagia. In acute gonococcal endometritis menorrhagia is almost the rule. Similarly the first menstrual periods after abortion and child birth may be excessive because the uterus is enlarged and imperfectly involuted. In prolapse and retroflexion the periods may be excessive. With chocolate cysts of the ovaries menorrhagia is a frequent symptom, perhaps because of the ovarian hyperæmia induced by the presence of the chocolate cyst. But it should be remembered that a ductless gland disturbance is probably associated with the incidence of these cysts in the ovaries.

Endocrine Disturbances Menorrhagia is a frequent symptom of ductless gland disease. In hyperthyroidism menorrhagia is characteristic of the early stages, but in advanced cases patients usually have amenorrhœa. The converse holds for hypothyroidism, although in cretinism the patient has amenorrhœa. In myxœdema, particularly in women over the age of 40, profuse menstruation is not uncommon. Similarly, in the early stages of acromegaly menorrhagia may be complained of, while with advanced cases the patient develops amenorrhœa. In the rare cases of persistent thymus and suprarenal hypoplasia menorrhagia is usually complained of.

In a large number of cases the menorrhagia is not associated with any structural abnormality in the pelvis or evidence either of general disease or ductless gland disorder. In past years it was customary to attribute menorrhagia to abnormalities of the myometrium, such as chronic inflammation and subinvolution. The modern tendency is to regard such cases as being caused by ovarian dysfunction. It must be admitted that there is little exact knowledge of the ovarian abnormalities, for it is only rarely that an opportunity arises to examine the ovaries. It will be pointed out later in this chapter that menorrhagia is the main symptom in some cases of metropathia hæmorrhagica, when no corpus luteum is produced in the ovaries. In the majority of cases, however, the menorrhagia of ovarian dysfunction is probably caused by over activity of the ovaries so that large and hyperplastic corpora lutea form in the ovaries and produce an extreme degree of secretory hypertrophy of the endometrium, which causes profuse and prolonged periods during its disintegration. Menorrhagia of this type is frequent at puberty and at the time of the menopause. Other cases arise for no obvious reason during the child bearing period of life,

although in the opinion of some authorities the menorrhagia is induced by coitus interruptus and by sex disorders. The menorrhagia induced by ovarian dysfunction is of great clinical importance, not merely because of its frequency but also because it is difficult to treat.

General Disease At the present day the cases of menorrhagia caused by general disease are not regarded as of the same importance as in past years. Menorrhagia is sometimes seen in morbus cordis, chronic pulmonary disease, and chronic nephritis. In chronic blood diseases pure menorrhagia is an infrequent symptom, although irregular and continuous bleeding sometimes develops in severe cases. Of late years the incidence of menorrhagia in thrombocytopenia has been well established.

Diagnosis

The patient must be investigated carefully to find the cause of the symptom. An accurate pelvic examination is necessary, which should be followed by a search for some general cause or for evidence of ductless gland disease. If the primary cause can be found, treatment consists in dealing with this cause rather than with the menorrhagia alone. In clinical practice it is found that a large number of cases are unassociated with structural abnormality, either in the pelvis or of the body generally. At the present day it is customary to regard them as being caused by ovarian dysfunction.

Treatment

Under this heading only those cases of menorrhagia without an obvious primary cause will be dealt with. Theoretically the cases can be treated either (1) by dealing with the ovarian hyperplasia by hormone therapy, (2) by restricting the amount of blood lost from the uterus by medication, (3) by inhibiting ovarian function either with X-rays or radium, (4) by operation upon either the uterus or the ovaries.

Hormone Therapy The problem is to devise a combination of hormones to reduce ovarian activity. Of all the sex hormones that are available for clinical purposes, there is not one that inhibits ovarian function. It is true that there is some experimental evidence that massive doses of oestrin reduce the activity of the anterior lobe of the pituitary. Clinical experience shows

however, that hormone therapy is of little service in the treatment of menorrhagia of this type. Nevertheless, good results are sporadically reported from the administration of various hormones, particularly of the anterior pituitary sex hormones. It is fair to say that much cannot be expected from hormone therapy of this kind (see p. 359).

Medication. Although the amount of blood lost from the uterus immediately after labour can be controlled by the administration of oxytocic drugs such as ergot and pituitrin, the uterine bleeding of menorrhagia cases is of a different type. The bleeding takes the form of an ooze from the raw and denuded endometrium and not from sinuses opening directly from the myometrium into the cavity of the uterus, which can be occluded by contractions of the muscle cells. Nevertheless, the bleeding can be controlled to some degree by ergot. The amount of blood lost can be reduced by the patient lying in bed and reducing her activity to a minimum. Treatment by medication is, on the whole, unsatisfactory.

Radiotherapy. The action of X-rays and of radium upon the ovaries is to inhibit ovarian function so that follicles fail to ripen and ovulation is inhibited. With castration doses of X-rays or radium, menstruation ceases after a variable interval. The patient subsequently develops menopausal symptoms, which are usually extremely severe in women between the ages of 30 and 45. These radiological methods of treatment are of very great service in the treatment of menorrhagia in women approaching menopausal age. In young women they should be avoided, because of the destructive effect of the radiations upon the ovaries. Sometimes an extreme form of kraurosis of the vulva follows upon the creation of an artificial menopause by radiological means, when the local symptoms of intense itching and irritation may outstrip the symptoms of which the patient originally complained. Most authorities do not now advise the creation of an artificial menopause by radiological means in women under 40, and the modern tendency is perhaps to advance the age limit to 45. The development of severe menopausal symptoms after radiological castration is not by any means inevitable, but if the symptoms develop they are so distressing as to make the practitioner reluctant to advise similar treatment in other cases. Curiously enough, such symptoms hardly ever arise in young women under the age of 36

The technique employed in creating an artificial menopause by radiological means will be described in detail in Chapter XXII

Efforts have been made to create a *temporary* artificial menopause in some cases, either with X rays or radium. Theoretically, the method is attractive, but it is extremely difficult to gauge the requisite dose with accuracy. This is particularly so if radium is used, for it is well nigh impossible to calculate the distance at which the ovaries lie from the cavity of the uterus and this is only one of the many factors which have to be taken into account. Similarly, with X rays such factors as the absorption of the rays by the abdominal wall are difficult to estimate. Temporary castration by X rays, when successful is an admirable method of treatment in certain cases, and the method should be tried if a skilled radiologist with the necessary equipment is available. Small doses of radium are sometimes recommended in the treatment of menorrhagia in young people, and although good results are sometimes obtained the method is on the whole unreliable.

In practice a certain number of patients are found in whom hormone therapy and medication have failed and for whom operation is contra indicated, who are suitable for the methods of temporary sterilisation. A guarded prognosis must always be given because of the unreliability of the treatment.

Operation Clinical experience shows that either the removal of one ovary or the excision of wedges from the cortex of both ovaries are unsatisfactory methods of treatment for menorrhagia, for the ovarian tissue which remains undergoes hypertrophy, and very soon the symptoms recur with their previous severity.

The operation of curetting the uterus also gives unsatisfactory results. In any case it is difficult to understand why menorrhagia should respond to the removal of the endometrium of the uterus by curetting. On the other hand, in some cases of menorrhagia, an adenomatous polypus of the endometrium may be suspected or there may be clinical evidence of a submucous myoma, and in such cases it is justifiable to explore the cavity of the uterus with the curette. If no abnormality is found within the cavity of the uterus little can be expected of the operation of curetting.

In some cases of severe menorrhagia the patient has to be treated by hysterectomy. Hysterectomy is a severe procedure, and the case must be considered very carefully before the operation is advised. If hysterectomy is performed the ovaries

should be conserved, for if they are removed an artificial menopause is created and the patient would have been treated just as efficiently by radiological methods, without the inconvenience of an abdominal operation. It is therefore important to emphasise the necessity of leaving the ovaries behind. The argument that the ovaries should be removed whenever the operation of hysterectomy is performed is fallacious, for there is no increased tendency for the ovaries to develop ovarian tumours after excision of the uterus. Moreover, the removal of the ovaries is of comparable importance to the removal of both testicles in the male, an operation which no surgeon will undertake unless the testicles are the seat of either tuberculous or malignant disease.

The decision as to whether hysterectomy should be performed in cases of menorrhagia depends upon the features of each individual case. If the woman has acquired a severe degree of anaemia and her general health is impaired by the menorrhagia, drastic treatment is justified. Similarly, if the woman has children and has no desire for further offspring, there would be more inclination towards hysterectomy than in the case of a recently married woman. Features of this kind must all be taken into account before deciding upon hysterectomy. If a woman is a good subject for operation, subtotal hysterectomy has a low mortality of the order of less than 1 per cent. With anæmic women preliminary blood transfusion reduces the operation risks and should be performed where indicated.

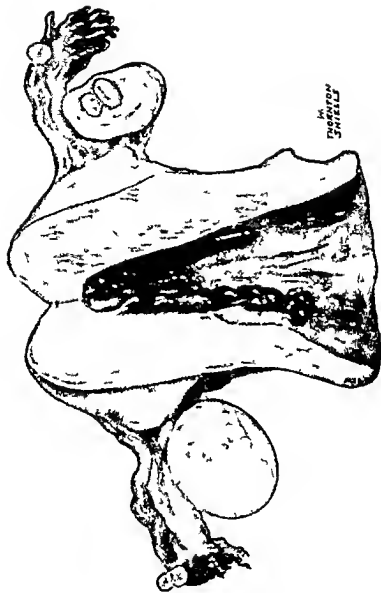
The above outline of the available methods of treatment in cases of menorrhagia shows that each individual case must be treated on its merits and not according to a fixed plan. With girls and young women, conservative treatment must be pressed to the utmost and every effort should be made to spare the patient from hysterectomy or the creation of an artificial menopause by X rays or radium. With other patients one would be more inclined to advise hysterectomy for intractable cases, while with women approaching the age of the menopause the creation of an artificial menopause by radiological means is an admirable method of treatment. Perhaps there is a tendency for gynaecologists to restrict their attention to the pelvis to control the uterine bleeding and to omit to employ general treatment for the anaemia. It is remarkable, however, how rapidly patients improve as soon as the severe uterine bleeding is controlled.

Polymenorrhœa

In polymenorrhœa or epimenorrhœa, the menstrual cycle is reduced from the normal of twenty eight days to a cycle of two to three weeks and remains constant at that frequency. Women with polymenorrhœa therefore menstruate more frequently than normal women, and the frequent menstruation is usually associated with excessive bleeding, which is prolonged. Polymenorrhœa of this kind is a common symptom in gynaecological practice. Little is known of the exact ætiology, but it is established that ovarian function is increased so that ovulation occurs more frequently than normally. It is not uncommon to find several corpora lutea of corresponding age if the ovaries are examined. The ovaries are often hyperæmic and contain blood follicles, and it is extremely common for the myometrium of the uterus to be thickened through myohyperplasia. The endometrium is sometimes found to be thicker than normal without polypoidal excrescences. In other cases the endometrium is of normal thickness without hypertrophy or hyperplasia. In polymenorrhœa it seems to be established that ovulation occurs more frequently as the result of over activity of ovarian function. The cause of the ovarian over activity does not necessarily lie in the ovaries themselves and it is more than probable that disorders of the anterior lobe of the pituitary are responsible for many cases of polymenorrhœa.

Clinical Aspect If the cases are considered purely from the clinical point of view clearly defined groups of cases can be distinguished. Perhaps the most frequent are the cases of polymenorrhœa developing after child birth. These cases can be explained by supposing that the increase in function of the anterior lobe of the pituitary which develops normally during pregnancy subsequently persists, so that the anterior pituitary sex hormone stimulates the ovaries to frequent ovulation with resultant frequent menstruation. This suggestion is purely hypothetical, for there is little direct evidence that this is the case. Post partum polymenorrhœa rarely leads to anæmia, although the woman naturally complains of the discomfort of frequent menstruation.

Polymenorrhœa is also a recognised symptom of salpingo-oophoritis when it is perhaps induced because the inflamed ovaries ovulate more frequently. There is some evidence also that the frequency of menstruation varies not only according to



Vietropathia Hemorrhag ca

race but also with latitude, so that a woman is likely to menstruate more frequently if she migrates to tropical climes. Polymenorrhœa is also a frequent symptom with chocolate cysts of the ovaries and uterine myomata. In the case of chocolate cysts of the ovaries, there is reason to believe that ovarian function is increased, polymenorrhœa being regarded as the natural sequel. With uterine myomata polymenorrhœa should be regarded as a coincident complication, for although the ovaries are typically hyperæmic in cases of uterine myomata, polymenorrhœa is by no means an invariable symptom.

A large number of cases of polymenorrhœa are found in women of menopausal age. In fact, the most frequent form of menstrual irregularity in women over the age of 40 is polymenorrhœa. In such cases the myometrium of the uterus is hyperplastic. The syndrome of polymenorrhœa associated with a bulky uterus in a woman of the age of about 45 is well recognised. It has already been emphasised that in such cases the ovaries are found to contain more than one corpus luteum, together with hæmorrhagic follicles. Polymenorrhœa may arise at any age during the child bearing period of life without localising physical signs in the pelvis. As with menorrhagia, efforts must be made to locate a primary cause in the ductless glands. In the early stages of acromegaly polymenorrhœa may develop, but such cases are uncommon. It is difficult on theoretical grounds to postulate that the cause of polymenorrhœa lies in the uterus itself, for there is no evidence that any abnormality of the uterus can disturb the rhythm of the menstrual cycle. It is therefore difficult to believe that local treatment applied to the uterus, such as, for example, curetting can be of service in the treatment of polymenorrhœa.

Diagnosis and Treatment The diagnosis and treatment of cases of polymenorrhœa depend upon the principles already outlined in the section on menorrhagia. The two types of case are in many ways comparable and should be regarded from the same point of view. So far as treatment is concerned, exactly the same lines should be followed as when dealing with menorrhagia. As yet, there is no specific drug or hormone capable of altering the rhythm of the menstrual cycle. Medication and hormone therapy can be employed to restrict the amount of blood lost during each period. Many women are content to suffer the inconvenience of frequent menstruation so long as they escape the effects of anæmia.

Metrorrhagia

In metrorrhagia the menstrual cycle is unaltered, occurring with normal rhythm and normal menstrual loss, but between each period there is vaginal bleeding. In other words, superimposed upon normal menstruation there exists an irregular and uncontrolled vaginal bleeding. In almost all cases the cause of the metrorrhagia depends upon the presence of some local abnormality either of the vulva, vagina or uterus, and these abnormalities can be demonstrated by physical examination. Among the causes of metrorrhagia are carcinoma of the cervix, uterine polypi, particularly mucous polypi of the cervix, vascular erosions, and, rarely, growths of the vagina and vulva.

In some cases of metrorrhagia the woman gives a history of regular intermenstrual bleeding on about the fourteenth day of the cycle, the hæmorrhage lasting only for a short time and being of small amount. These hæmorrhages are of some academic interest, for they are comparable to the pro æstrus bleeding of animals and are caused by oozing of blood from the hyperæmic endometrium at the height of the proliferative stage of the menstrual cycle. Clinical experience shows that the condition arises most frequently in woman about the age of 35, and that the hæmorrhages are often combined with severe pain in the lower abdomen. Treatment is unsatisfactory, but good results have been reported after curetting.

Metropathia Hæmorrhagica

There is a tendency to group under the term "metropathia" cases of irregular and excessive uterine bleeding in which no local abnormality can be detected by pelvic examination. In past years, in this country, the ætiology of these cases, so frequent in gynæcological practice, was attributed to inflammation either of the myometrium or endometrium, and the tendency was to group them under such terms as chronic metritis, chronic endometritis, fibrosis uteri, and delayed subinvolution. The modern view is to regard them as being determined by ovarian dysfunction, which leads to an irregular menstrual rhythm and prolongation of the period of menstrual discharge. It must always be borne in mind, however, that the term metropathia should be restricted to those cases in which there is no local cause for the bleeding in the uterus. Polypi and vascular erosions must be excluded before the diagnosis can be made.

The best established form of metropathia is that described under the term *metropathia hæmorrhagica*. In this disease the endometrium of the uterus is thick and polypoidal, and one or other ovary contains a cystic follicle. The disease is most prevalent in women over the age of 40, the maximum incidence

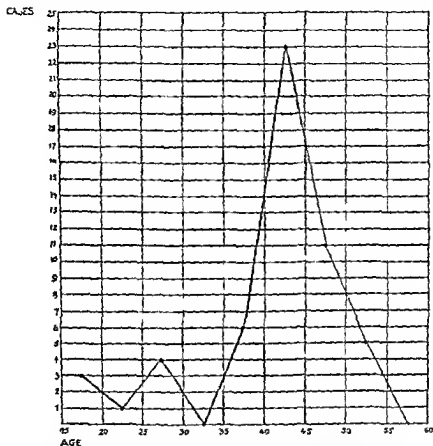


FIG. 108. The age incidence of metropathia hæmorrhagica. The maximum age incidence is between 40 and 45, but a few cases are seen before the age of 20.

being between the ages of 40 and 45. Occasionally it develops in young girls under the age of 20, when by producing prolonged periods of uterine bleeding it may lead to a severe degree of anæmia. It is not uncommon between the ages of 45 and 55, and accounts for many cases of irregular and prolonged bleeding in women who have delayed menopause. There is little evidence that parity is related to its incidence. Similarly, there is no evidence that it is determined by infection of the genital tract,

and it seems to be established that it develops only very rarely indeed in cases of uterine myomata

The symptoms are very typical. The most common complaint is of continuous vaginal bleeding which may last for many weeks. In half the cases the continuous bleeding is preceded by a short



TYPE I



TYPE II



TYPE III

FIG. 109. The menstrual histories in cases of metropathia hæmorrhagica. Continuous uterine bleeding is the most constant symptom and most frequently this is preceded by amenorrhœa of about eight to ten weeks' duration. Sometimes the bleeding follows upon a normal period, while at other times the continuous bleeding may be preceded by menorrhagia.

period of amenorrhœa, an interval of about eight weeks elapsing between the last period and the onset of the continuous hæmorrhage. The continuous bleeding is not usually particularly severe and is comparable to the normal menstrual discharge, consisting of dark fluid blood. It is exceptional for patients to have severe bleeding on any particular day, but the continuous

drain of blood in due course produces a state of anæmia. There are sometimes departures from the typical history. The continuous bleeding may start at the time a period is expected, or it may be preceded by menorrhagia without any intervening period of amenorrhœa.

The clinical history of typical cases is similar to that obtained with ectopic gestation and abortion, and these two conditions

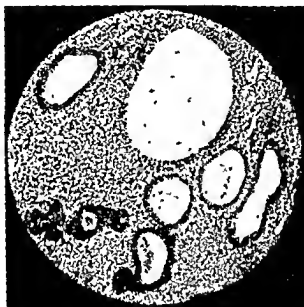


FIG 110 Endometrium from a case of metropathia hæmorrhagica showing cystic glandular hyperplasia of the endometrium

must always be borne in mind when the differential diagnosis is considered. The physical signs which are usually obtained are those of a slight symmetrical enlargement of the uterus together with the presence of a cystic ovary. If care is taken over the history, it is fairly easy to diagnose the condition clinically.

Pathological Anatomy

The Uterus. There is usually a mild degree of myohyperplasia of the myometrium which causes the symmetrical enlargement of the uterus. The endometrium is thick, hæmorrhagic, and polypoidal, and thin, slender polypi project downwards towards the internal os. These features of the endometrium have long

and it seems to be established that it develops only very rarely indeed in cases of uterine myomata

The symptoms are very typical. The most common complaint is of continuous vaginal bleeding which may last for many weeks. In half the cases the continuous bleeding is preceded by a short



TYPE I



TYPE II



TYPE III

FIG. 109. The menstrual histories in cases of metrorrhagia hemorhagica. Continuous uterine bleeding is the most constant symptom, and most frequently this is preceded by amenorrhœa of about eight to ten weeks' duration. Sometimes the bleeding follows upon a normal period, while at other times the continuous bleeding may be preceded by menorrhagia.

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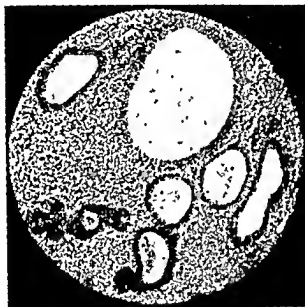


FIG. 110. Endometrium from a case of metropathia hæmorrhagica showing cystic glandular hyperplasia of the endometrium.

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FIG 111 *Metropathia hemorrhagica*. The wall of the uterus showing areas of necrosis in the surface part of the endometrium together with cystical dilated glands

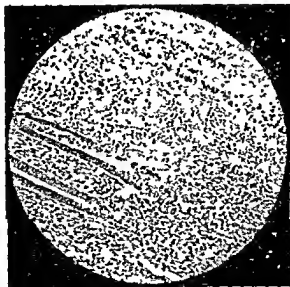


FIG 112 The areas of necrosis in the endometrium from a case of *metropathia hemorrhagica*. The appearances are similar to those found in the endometrium on the first day of menstruation.

been recognised under the term polypoidal endometritis. The endometrium has very characteristic features when examined under the microscope. In the first place, the endometrium shows the characteristics of a cystic glandular hyperplasia. Many of the glands show cystic dilatation, and the larger cysts can be distinguished with the naked eye.

2) The second characteristic is the absence of secretory hypertrophy, so that corkscrew-shaped glands are never seen.

3) Thirdly, areas of necrosis are scattered over the superficial



FIG. 113. The wall of the cyst in the ovary from a case of metropathia hæmorrhagica. The appearances are those of a ripening follicle, but the granulosa cells show a minor degree of luteinisation.

layers of the endometrium and the histological features in these necrotic areas correspond with those found in the menstruating endometrium. The histological picture of the endometrium is that of an abnormal hyperplastic endometrium which is menstruating continuously without signs of secretory hypertrophy. Some degree of adenomyosis is invariably found in these cases.

Ovaries. One or other ovary always contains a cyst which is seldom more than 2 in. in diameter. The opposite ovary is usually atrophic. Recent corpora lutea are never found in the ovaries. The cyst has the characters of a cystic ripening

follicle, but it is not uncommon for both the granulosa and theca interna cells to show some degree of luteinisation. The ovarian changes indicate, therefore, that ovulation and corpus luteum formation are inhibited, and that for some reason or other a Graafian follicle becomes cystic.

The disease shows an association between ovarian dysfunction and an abnormal condition of the endometrium. The endometrium can be regarded as menstruating continuously, but little is known of the factors which determine the development of the disease.

Treatment The principles of treatment correspond to those which have been outlined in the section on menorrhagia, except that for no clear reason curetting of the uterus cures a certain percentage of cases. It is important that curetting should be performed carefully and as much as possible of the endometrium scraped away. The most difficult cases are the young girls under the age of 20, for if pronounced anaemia is produced by the continuous bleeding and conservative methods of treatment have failed it may be necessary to perform hysterectomy. In recent years metropathia hæmorrhagica has been treated by the administration of the female sex hormones. The most modern treatment consists in the injection of progesterone. The dose required varies for the individual case and the requisite amount can only be determined by waiting for the excretion of pregnandiol in the urine. When pregnandiol appears the requisite amount of progesterone is being given. The best results seem to follow the administration of œstrone and progesterone in combination. This method of treatment should be employed before any kind of operation is considered. With women of menopausal age the most satisfactory treatment is to introduce a tube containing 50 mgm of radium into the cavity of the uterus, leaving it there for forty eight hours.

Other Forms of Metropathia

In other types of irregular uterine hæmorrhage the clinical history is one of irregular menstruation or irregular bouts of prolonged uterine bleeding. Such cases probably represent other manifestations of ovarian dysfunction although it may be difficult to produce reliable evidence that this is the case. In one group, ovulation is inhibited and a cyst is found in the ovaries similar to that found in metropathia hæmorrhagica, but

without the typical changes in the endometrium. If the endometrium is examined microscopically during the period of bleeding, areas of necrosis similar to those found in the menstruating endometrium can be demonstrated, but without secretory hypertrophy, and without cystic glandular hyperplasia. Such hæmorrhages are therefore similar to the anovular bleedings found in macaque monkeys. Cases of this kind are most frequent in women of menopausal age, and the treatment corresponds to what has been outlined in the section dealing with menorrhagia.

The Operation of Curetting

The operation of curetting the uterus is mainly performed for diagnostic purposes. In suspected cases of carcinoma of the body of the uterus, of adenomatous polypi of the endometrium and of chorion epithelioma, it is customary to curette the uterus

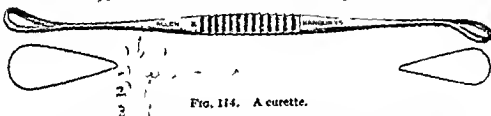


FIG. 114. A curette.

and to examine histologically the material which is scraped away. Similarly, in cases of irregular uterine hæmorrhage in women of menopausal age the modern practice is to curette the uterus prior to the insertion of a tube of radium and to examine the material obtained histologically in order to exclude the presence of malignant growth.

In addition to the use of curetting for diagnostic purposes the operation is sometimes performed therapeutically. Examples are afforded by cases of metropathia hæmorrhagica, by retained products of conception, by persistent uterine bleeding following upon abortion or parturition, and, in the opinion of some authorities, though this is by no means universal, in cases of sterility and dysmenorrhœa. The modern tendency is, however, to use the operation mainly for diagnostic purposes. In past years the uterus was curetted therapeutically for all types of gynaecological complaints, and not infrequently was disinfected with strong antiseptics and caustics. With retained products of conception and when persistent bleeding follows upon abortion curetting may light up latent infection so that the patient may

develop a high temperature and, in rare cases, even septicæmia. Curetting is always contra indicated if there is clinical evidence of sepsis or netive infection in the pelvis. In the treatment of sterility and dysmenorrhœa simple dilatation of the cervix is probably of more importance than curettage.

Technique of Operation The preliminary stages are exactly the same as those described in the operation of dilatation of the cervix (p. 329). After the cervical canal has been dilated sufficiently to admit the curette the endometrium is scraped away, starting with the anterior wall of the uterus and working carefully around the inner wall until all the endometrium has been scraped away. The material removed should be collected by placing a piece of lint in the posterior fornix behind the cervix. Flushing curettes are useful because they wash almost all of the material which has been removed from the cavity of the uterus, though the solution may damage the material and spoil the histological preparations. The removed material should be fixed in 95 per cent spirit. A blunt curette should always be used in post partum and post abortion cases, for the sharp curette may easily damage the soft and friable uterus.

CHAPTER XVI

HORMONE THERAPY IN GYNÆCOLOGY

THE administration of the sex hormones plays an important part in modern gynæcological therapeutics. Many of the sex hormones have been isolated in a state of purity and some of them have been synthesised. The hormones are therefore available in dosages which can be controlled with precision. Moreover, the hormones can be obtained at a cost which is within the means of the average patient. It is, therefore, the duty of the medical profession to have some knowledge of the indications for the use of these substances in clinical gynæcology.

Unfortunately, the indications for treatment are not always well defined, nor is it possible to gauge the correct dosage except by trial. There is no simple method of determining the concentration of œstrin, progesterin, or the anterior pituitary sex hormones either in the blood or in the urine excreted. It is for this reason that gynæcological therapeutics have not the scientific precision of the treatment of diabetes with insulin. Moreover, the physiology of the sexual functions is highly complex with many of the other ductless glands interrelated in function. Disorders of menstruation and of the sexual functions are therefore not always easy to diagnose with precision on clinical grounds. Another difficulty is that many of the gynæcological disorders which respond to hormone therapy also tend to undergo spontaneous remission. It is not always correct to maintain that improvement results from treatment for it may have been spontaneous. Another mistake which is often made is to postulate that most functional gynæcological disorders respond to hormone treatment. Experience shows that this is far from being the case and the treatment of menorrhagia and dysmenorrhœa by hormone therapy should never be undertaken with optimism. The first essential is to be exact in diagnosis and it is doubtful if a high standard can be achieved without a precise knowledge of sexual physiology and pathology. The second essential is to select cases for treatment on a scientific basis. Unless there are rational indications for hormone therapy it is doubtful if this form of treatment should be employed.

Therapeutics

Amenorrhœa. The theoretical basis for the therapy is to induce hypertrophy of the myometrium with œstrin, to stimulate proliferative hypertrophy of the endometrium with œstrin and secretory hypertrophy with progestin. Clinically, the cases can be grouped into those to which a good prognosis can be given, e.g., cases of secondary amenorrhœa in young women, cases of delayed onset of puberty, amenorrhœa arising subsequent to severe illness and amenorrhœa following upon prolonged lactation, while a cautious prognosis should be given to severe cases of primary amenorrhœa and early onset of the menopause. The treatment is useless if there are such congenital defects as fetal uterus, failure of development of the uterus or vagina.

Dosage

The relative merits of the different œstrogens are discussed on p. 80. The present tendency is to commence all forms of œstrin therapy by the administration of stilbœstrol by mouth. Oral administration is much the most convenient method and the results obtained with the synthetic œstrogens such as stilbœstrol, hexœstrol and diœœstrol are at least as good as those obtained with œstrogens obtained from natural sources. This point of view may not be universally accepted and it is possible that natural œstrogens give better results than stilbœstrol in certain types of case. It is, however, much better to commence treatment with stilbœstrol and if there is no response, to resort to the natural œstrogens which are given by injection. Treatment with the female sex hormones has not the scientific exactness as, for example, the treatment of diabetes with insulin. No simple biochemical method is available to determine the œstrin content of the blood or urine and the result of treatment may be judged only by whether or not the patient develops uterine bleeding. It follows that the exact dose required to cause uterine bleeding can be determined only by trial. Over dosage is followed by the development of toxic symptoms such as headaches, malaise and sometimes vomiting. If the case is regarded as being of a minor degree, a dose of 1 mgm. stilbœstrol should be given twice a day. In severe cases, 5 mgm. stilbœstrol should be given once a day and the dose can be increased to at least 5 mgm. three times a day provided toxic symptoms do not develop. If the patient is sensitive and

develops toxic symptoms with small doses, stilboestrol should be given subcutaneously. As a general rule, uterine bleeding starts within fourteen days of the stilboestrol treatment. It is difficult to explain why the hæmorrhage develops. The hæmorrhage is most likely to be comparable to œstrin withdrawal bleeding and not comparable to normal menstruation following upon the development of a secretory endometrium. For this reason, it is recommended that œstrin treatment should be continued for three weeks and then during the fourth week in addition to the œstrin therapy, progesterone should be administered in doses of 2 mgm on alternate days. There has been some apprehension as to whether œstrin therapy may possibly result in the development of malignant disease, for some œstrogenic substances have been found to be carcinogenic. There is no clinical evidence of this possibility and it should be remembered that enormous concentrations of œstrin permeate the body tissues during pregnancy without harmful effect. If large doses of œstrogens were administered to a patient over a long period of time, there might be a possibility of the development of malignant disease. Œstrin and chemical carcinogenic agents both stimulate tissues to activity and it is not without interest that they seem to be somewhat similar in their chemical constitution.

A rough method of determining the concentration of œstrin in a patient's tissues is that introduced by Mack in which the vaginal epithelium is gently swabbed with a cotton applicator, smeared on a glass slide and stained by the vapour of Lugol's solution. If the œstrogenic functions of the body are good, the cells contain a glycogen like substance and stain brown. This simple test may be of some service in determining the patient's œstrogenic activity.

Results of Treatment The results of treatment are extremely good in selected cases, and in minor cases of amenorrhœa the treatment should be regarded as specific. In primary amenorrhœa with signs of polyglandular disturbance the results are poor. One of the main disadvantages of the treatment is that improvement is not permanent except exceptionally, so that the injections must be repeated in most cases. On the other hand, if the treatment is successful there is nearly always well marked improvement in the general health which is more than can be accounted for by the improvement in the psychology.

It cannot be too strongly emphasised that the case of

amenorrhœa to be treated with œstrin must be selected with the greatest care. There is no prospect of cure with severe cases or when a primary ovarian insufficiency is not the cause of the symptom.

Anterior Pituitary Sex Hormones

These hormones have not been isolated in a state of chemical purity, nor have they been synthesised. It is established that the hormones secreted by the chorionic villi during pregnancy and which are excreted in the urine during pregnancy are different chemically from the hormones secreted by the anterior lobe of the pituitary gland. The hormones are now referred to as chorionic gonadotropin and serum gonadotropin. Serum gonadotropin causes ripening of the Graafian follicle and induces ovulation with the subsequent conversion of the follicle into a corpus luteum. On the other hand chorionic gonadotropin induces luteinisation without prior follicle ripening. The above reactions of chorionic gonadotropin are obtained if the anterior pituitary has previously been removed. On theoretical grounds, serum gonadotropin should be employed therapeutically in preference to chorionic gonadotropin. The dosage is probably the order of 36 I U. daily and must be given by injection.

The theoretical basis for employing gonadotropic hormone is to stimulate ovaries to activity in cases such as amenorrhœa and to restore regular ovarian function in conditions such as metropathia hæmorrhagica when the normal ovarian rhythm has been disturbed. Such treatment is of necessity less precise than the employment of œstrin and progestin, for there is usually little knowledge of the exact state of the ovaries in the case treated, and other factors such as the effect of other ductless glands must influence the response of the ovaries.

Clinical experience shows that treatment of amenorrhœa with gonadotropic hormone is unsatisfactory. Most workers agree that the hormone is of far less potency in this type of case than œstrin and progestin while some workers go so far as to say that gonadotropic hormone is of little use for these cases.

Oligomenorrhœa and Hypomenorrhœa It must be admitted that less work has been done on these cases than on those of amenorrhœa. With hypomenorrhœa it is customary to treat in the same way as with amenorrhœa though smaller doses are necessary. In most cases the results are excellent but there

seems to be a group of cases due to over activity of the corpus luteum and no response is obtained

Menopausal Symptoms These cases belong essentially to the general practitioner. The results of the administration of oestrin in the treatment of these cases are admirable. Nearly all of the characteristic symptoms, such as flushings, sweatings, irritability, depression, lack of vitality, are almost miraculously relieved. Moreover, relatively small doses of oestrin are necessary, and 1 mgm of stilboestrol twice a day by mouth is the usual dose. There is also good reason to believe that some of the cardiovascular disturbances such as hyperpiesia, and even cases of arthritis, respond in some degree to the administration of oestrin. Larger doses than those indicated above may of course be used for refractory cases. For the treatment of the severe menopausal symptoms which follow upon the creation of an artificial menopause with radium and X rays, doses of about 5 mgm stilboestrol daily are required.

Pruritus Vulvæ and Kraurosis Vulvæ Kaufmann showed that patients of menopausal age suffering from pruritus vulvæ were specifically cured by the administration of oestrin. It must be admitted that until Kaufmann's work a characteristic pruritus vulvæ in women of menopausal age was not recognised in this country. It is however, now established that cases of this kind respond well to oestrin. Care must of course be taken to exclude such conditions as diabetic vulvitis. The dosage varies with the particular case. In mild cases daily doses of 5 mgm of stilboestrol should be given, and larger doses can of course be used for refractory cases. Practitioners must realise, however, that only the strictly menopausal cases are suitable for the treatment, for idiopathic cases the usual methods of treatment are necessary.

Recently good reports have been published of the treatment of kraurosis vulvæ with massive doses of oestrin. Relatively large doses of the order of 10 mgm of stilboestrol three times a day are necessary. Kraurosis vulvæ is one of the most distressing complaints from which any woman may suffer, and the treatment is justifiable if the requisite amounts of the hormone are obtainable. It seems, however, to be well established that the condition does not respond to small doses of the hormone. It has been shown that the hormone can be given percutaneously in ointment form with some success for pruritus vulvæ and kraurosis.

Vulvo-vaginitis and Vaginitis It is now well established that cases of vulvo vaginitis in children clear up admirably if the patients are treated with œstrin combined with sulphapyridine. The hormone stimulates to activity the epithelium of the vagina, which is thus made more resistant to infection. A good response is obtained in both gonococcal and non gonococcal cases. The hormone should be given by mouth in daily doses of about 1 mgm stilbœstrol. Even small children may be given doses such as this without ill effect, and when necessary the dose can be increased. Vaginal pessaries of children's size containing 1,000 I U are put up, and are used for cases of this kind. Local treatment is of course carried out in the usual way in addition to treatment with œstrin.

Quite recently evidence has accumulated that the same principles hold good for cases of vaginitis in adults. Trichomonad cases respond particularly well. Care must be taken to select the right type of case for the treatment for it. It is useless to use œstrin when the discharge emanates from the cervix and leucorrhœal discharge due to excessive desquamation of the vaginal epithelium does not respond. Pessaries impregnated with the hormone are used in the treatment of cases, but the hormone should also be given by mouth and a dosage of 5 mgm of stilbœstrol daily is recommended.

Habitual Abortion and Threatened Abortion There is experimental evidence to show that the corpus luteum is essential for the maintenance of the embedding of the ovum in the early weeks of pregnancy, although it is well known that the corpus luteum and even the ovaries may be removed later in pregnancy and yet the patient go to term. There is therefore a scientific basis for the treatment of habitual abortion and threatened abortion with progestin. Doses of about 5 I U three times a week during the early weeks of pregnancy are advised. Treatment must be used with the greatest caution. Often there is little real evidence that a corpus luteum deficiency is the cause of the repeated miscarriages. Further, it is more than probable that the progestin hormone causes hyperæmia in the endometrium when it is administered therapeutically, and if the patient already suffers from overactivity of the corpus luteum an abortion may be directly induced by this form of treatment. It is therefore advised in cases of habitual abortion that the uterus be curetted during the secretory phase—prior to pregnancy—to determine by histological examination of

the curettings whether or not there are signs of corpus luteum deficiency

The administration of progestin and of the gonadotropic hormone as a routine measure in all cases of habitual abortion should be strongly condemned. It is essential first to establish an accurate diagnosis. With moderate care it is possible to establish whether or not the case is due to an endocrine deficiency or dysfunction. In some cases there may be evidence of ill development of the genitalia, when oestrin should be given in large doses before the patient becomes pregnant. If curettings show that secretory hypertrophy is deficient, then it is scientific to administer progestin both prior to pregnancy and during the early months. Clinical evidence is inconclusive as to the value of this treatment in these cases, due perhaps to lack of accurate diagnosis and care in selecting the correct type of case to treat.

The merits of gonadotropic hormones in the treatment of this type of case has been put forward very strongly by some authorities. All gynaecologists will claim favourable results from treatment with this hormone. Yet critical analysis of cases will lead to the conclusion that the gonadotropic hormone is not so efficient as progestin and oestrin in the treatment of this type of case.

With threatened abortion, the first principle of treatment is to employ the customary remedies of rest in bed and opium. Hormonal treatment should consist in the administration of progestin in as large doses as possible. The treatment should be regarded as empirical unless there is good evidence that endocrinal factors are the probable cause of the abortion. It is irrational to employ hormonal treatment if the cause of the threatened abortion is indeterminate.

Sterility Clinical experience shows that the administration of oestrin and progestin is of the greatest value in the treatment of sterility provided that the correct type of case is chosen for treatment. As in all cases when the possibility of hormonal treatment is under consideration, the first essential is to decide whether or not the case is suitable for this treatment. It is obviously absurd to choose hormonal methods if the patient has been shown to be suffering from occluded Fallopian tubes. Similarly, faults of the husband must be excluded before this method of treatment should be adopted. The greatest care must therefore be taken in selecting the correct type of case. In prac-

tice it will be found that the type of case most suitable for the therapy is when there are clear signs of ill development of the uterus or when there is evidence of ovarian dysfunction. The usual technique of giving œstrin together with injections of progestin during the week prior to menstruation is recommended. The aim and object of the method is to stimulate hypertrophy of the uterus and to replace insufficiencies in ovarian function with œstrin and progestin.

Dysmenorrhœa It is clear that as dysmenorrhœa is usually associated with ill development of the uterus therapy with the uterus stimulating hormone œstrin is scientifically correct. Clinical experience however does not support this hypothesis. In general the results are unsatisfactory although from time to time improvement is recorded. Similarly, it has been suggested that progestin by its action as an inhibitor of uterine contractions might be useful in this class of case. Again there is little or no clinical evidence to support this view. It will be found however, that many gynecologists recommend both œstrin and progestin for cases of this kind. It may be that at some future time response will be obtained from very large doses of these hormones but it seems clear that a specific effect cannot be claimed with the doses used at the present day.

Recently androgens have been employed in the treatment of dysmenorrhœa and good results have been reported. Testosterone propionate is given in doses of 25 mgm. two or three times weekly, during the last two weeks of the menstrual cycle. Good results have been claimed in the treatment of mittel schmerz premenstrual mastopathy menopausal symptoms and even post partum engorgement of the breasts.

Inhibition of Lactation There is experimental evidence to show that œstrin inhibits the activity of the anterior lobe of the pituitary and that thereby the secretion of the lactogenic principle is reduced. The therapeutic application clearly lies in the administration of œstrin during the puerperium when the breasts are painfully engorged or when lactation is contra-indicated. Illustrative examples are to reduce mammary distension after delivery of a still born child and to reduce the activity to a moderate degree when the breasts are abnormally distended and painful when the milk comes into the breasts. Large doses of the hormone are required and stilboestrol should be given by mouth in doses of 5 mgm. three times a day. The results are often remarkably good.

Summary It may be thought that the above account of the application of the female sex hormones is unduly optimistic. The position is that reliable clinical work is now at hand to show that oestrin has specific clinical effects. The prime difficulty is to select appropriate cases for treatment, and it is becoming increasingly more evident that very great clinical skill and judgment are required to diagnose cases with the necessary accuracy. For example, in sterility only about 10 per cent of cases seen are suitable for hormonal treatment. The same remarks apply to cases of pruritus and habitual abortion. The best results are obtained with amenorrhœa, vaginitis and menopausal symptoms. To give the hormones haphazardly is not only unscientific but disappointing. Again, it is not yet established definitely what emphasis should be placed upon the hormone progesterin. It is more than probable that the doses in use at the present time are far too small. It is probably true to say that its clinical properties are not yet established. Sceptics will point out that it is difficult to believe that a variety of gynaecological complaints of totally different nature respond to exactly the same treatment. This point of view is clearly wrong. For example, oestrin causes the uterus to hypertrophy, replaces deficiencies in ovarian secretions, and lastly stimulates the body metabolism. One or other of such factors may obviously be the basis of one or other of the gynaecological complaints mentioned above.

Functional or Irregular Uterine Hæmorrhage The results of the treatment of cases of irregular and functional uterine hæmorrhage with the female sex hormones are indefinite. In the first place, there is much confusion in selecting the correct type of case. At the present day there is a tendency to call any case of menorrhagia, polymenorrhœa or irregular hæmorrhage when no pathological lesion can be discovered, one of functional uterine bleeding. The term metropathia hæmorrhagica is used most unscientifically, and often the diagnosis is made with little evidence. There is much to be said for adopting the view that the majority of cases of irregular uterine bleeding depend upon ovarian dysfunction, yet it seems to be quite wrong to suppose that all types of case have the same pathology so that the same hormonal treatment is indicated. So far as present knowledge goes, the hormonal treatment of metropathia hæmorrhagica and of polymenorrhœa should be diametrically opposed, whereas in some published reports exactly the same treatment has been

employed. The first step should be to make a correct diagnosis of the case, and when there is doubt the uterus should be curetted and the curettings examined microscopically. The next step is to decide whether the case is suitable for hormone therapy and if so, which particular hormone is to be used.

In *Metropathia Hæmorrhagica corpus luteum* function is inhibited—no corpus luteum is found in the ovaries and there are no secretory changes in the endometrium. It is therefore reasonable to administer progestin or the gonadotropic hormones. There is no necessity for the clinician to probe further into the theories as to why the corpus luteum is deficient. It must be emphasised that *metropathia hæmorrhagica* may undergo spontaneous remission, particularly in young patients. Also the diagnosis must be established with precision by a preliminary curetting or endometrial biopsy. Furthermore, the pregnandiol excretion in the urine must be estimated and recorded throughout treatment. Progesterone should be given in doses sufficient to cause pregnandiol excretion in the urine and in some cases daily doses of 50 mgm progesterone are necessary. The preparation ethisterone (pregneninolone) may be given orally in doses of about 10 mgm daily. Puberty cases are said to respond best, and optimistic reports have been published. It is more than probable that doses of the order of 50 mgm are necessary for well established cases (see p 340). Practitioners will ask whether they are justified in advising expensive treatment of this kind for their patients. The answer is that in puberty cases and in young women suffering from the disease every effort must be made to save the patient from drastic treatment such as hysterectomy or radiological castration, whereas in women of menopausal age it is perhaps best to curette under anaesthesia and introduce a tube of radium. The effect of the sex hormones is not permanent and the condition tends to recur, so that further courses of treatment may be necessary.

In *Polymenorrhœa* there is very little evidence that either progestin or the gonadotropic hormone has any clinical effect. There is little theoretical basis for the therapy, except perhaps that progestin may have an inhibitory action. Quite recently very large doses of œstrin have been administered to cases of this kind and good results have been reported. It seems to be established that massive doses of œstrin delay the onset of menstruation even in healthy women. The treatment is

obviously drastic, and it is doubtful if it should be used in the average case.

In Menorrhagia good results are reported from time to time from the use of progestin and gonadotropic hormone. There is often no scientific basis for the treatment, and it is difficult to understand why the condition should respond except very rarely. It is well known that menorrhagia may be an early, almost a prodromal symptom of metropathia hæmorrhagica, when there is some reason perhaps to expect a good result. Against this is the fact that such types of menorrhagia comprise only a very small proportion of cases seen, and the diagnosis can only be established with certainty by microscopical examination of curettings. Incidentally, the average cases of menorrhagia and polymenorrhœa represent the best examples of over activity of the ovaries, and it is difficult to believe that the conditions are likely to respond to the administration of further ovarian hormones.

In addition to the classical types of functional uterine hæmorrhage mentioned above, there are of course other irregularities of the menstrual functions which are becoming recognised clinically and which are rather similar to metropathia hæmorrhagica. These cases sometimes respond to progestin and the gonadotropic hormones.

Summary of the Treatment of Functional Hæmorrhage. Hormonal treatment of the majority of cases is empirical. It has not the specificity of the treatment of amenorrhœa with œstrin, and in consequence improvement cannot be expected in most cases. The possible exception is metropathia hæmorrhagica, and this condition comprises at the most only 25 per cent of cases of functional uterine hæmorrhage.

CHAPTER XVII

INFLAMMATIONS OF THE UTERUS

Acute inflammations of the uterus are common and are exemplified by septic abortion, puerperal sepsis and acute gonorrhœa. Chronic inflammations of the body of the uterus are rarely seen, probably because the endometrium of the body of the uterus menstruates every month which allows the infected material to drain away. Chronic inflammations of the cervix and particularly of the racemose glands of the cervical canal are common for the inflammation shows little tendency towards spontaneous healing.

Acute Endometritis

It has already been stated that acute endometritis is best represented in septic abortion, puerperal sepsis and acute gonorrhœa. In all three conditions the other clinical features of the case tend to overshadow the inflammation of the endometrium of the uterus. From the purely pathological aspect however, in septic abortion and puerperal sepsis the acute inflammation of the endometrium is the essential feature of the case. In acute gonorrhœa infection of the endometrium of the uterus is by no means invariable though fairly common but because acute gonococcal endometritis of itself causes relatively few symptoms the other clinical features of the attack of gonorrhœa are more observed and more investigated.

Acute endometritis may develop during acute infections such as typhoid fever, pneumonia and influenza when it causes fairly profuse vaginal bleeding and discharge. The typhoid cases are not particularly common at the present day but were well recognised by Matthews Duncan and his contemporaries. Endometritis may follow upon the introduction of tents dilators and, particularly, radium tubes into the cavity of the uterus when it gives rise to uterine bleeding and discharge.

The clinical features of septic abortion and puerperal fever, viz., high fever and purulent vaginal discharge, are well known. The uterus is tender and, because of œdema and hyperæmia, is

larger than normal. The histological appearances of the lining of the uterus are those to be expected in acute inflammation. The endometrium is hyperæmic with a multitude of dilated capillaries and small interstitial hæmorrhages. The stroma is œdematous, and infiltrated with leucocytes and plasma cells and the leucocytic infiltration is often of an extreme degree. In septic abortion and puerperal sepsis the infective processes involve the myometrium to a variable degree so that the myometrium is œdematous and infiltrated with small round cells.

In gonococcal endometritis the infiltration with round cells is scattered irregularly over the endometrium, and there is little evidence of any involvement of the myometrium. In acute gonococcal endometritis the intense hyperæmia of the inflamed endometrium causes an oozing of blood into the cavity of the uterus which may cause continuous bleeding. Clinically, in acute gonorrhœa the development of uterine bleeding is a characteristic sign of gonococcal infection of the endometrium. Probably similar processes are responsible for the hæmorrhages met with in acute endometritis caused by such diseases as typhoid fever.

The acute endometritis of puerperal sepsis and septic abortion is dealt with in text books of obstetrics. In gynæcological practice, it is only rarely that cases of acute endometritis are seen. The two examples which are encountered with any frequency are acute gonococcal endometritis and the acute endometritis caused by the application of radium to the uterus. Conservative measures are always employed. In gonorrhœa, the essential treatment is with sulphapyridine. Intra uterine medication with antiseptics is unnecessary and may do more harm than good. Vaginal douching with hot solutions may be of some help because of the application of heat to the pelvis. The case should always be watched carefully, for salpingitis may develop from the upward spread of the infection to the Fallopian tubes. In most cases of acute endometritis, the blood stained discharge from the uterus clears up spontaneously after a few weeks. Menstrual periods which occur during or after acute endometritis are usually excessive, particularly those developing after the application of radium. The patient should be kept in bed during the menstrual period and given ergot.

Except for the acute endometritis of septic abortion and puerperal sepsis, acute endometritis should not be regarded as a

serious disease. Unless it is infected by virulent organisms such as hemolytic streptococci, the endometrium seems capable of dealing with infections by its own resistance, partly because infected material can drain away from the uterus through the cervical canal, but mainly because the superficial layers of the endometrium are normally discharged every month, which allows the infected material to drain away.

Chronic Endometritis

Chronic endometritis is relatively uncommon. Some degree of chronic infection of the endometrium accompanies any persistent source of infection in the uterus such as infected myomatous polypi, carcinoma of the cervix and body of the uterus, and the rare neoplasms such as sarcoma and chorion epithelioma. Tuberculous endometritis (cf. p. 154) and syphilitic endometritis are rare forms.

Pyometra, which is usually met with in elderly women, is one of the best recognised forms of chronic endometritis. Pyometra is caused by a stenosis of the cervical canal either from a carcinoma of the cervix, as the result of operation on the cervix such as amputation, or lastly by post menopausal involution of the uterus which leads to the cervical canal becoming blocked in the region of the internal os. The pent up discharges from the glands of the endometrium collect in the uterine cavity and become infected, the infection probably reaching the body of the uterus by upward spread from the vagina. Later, as a result of the infection, the lining wall of the endometrium becomes converted into granulation tissue which discharges pus into the uterus to produce a pyometra. Pyometra of accessory cornua of the uterus have already been described in Chapter V in the section dealing with Malformations of the Uterus.

In chronic endometritis, the histological appearances of the endometrium are as follows. The stroma is infiltrated with leucocytes and plasma cells, and the capillaries are dilated. Granulation tissue is found in cases of pyometra and in the vicinity of degenerate malignant growths. The essential symptom of chronic endometritis is bloodstained purulent discharge, but this symptom is characteristic of all the conditions leading to the development of chronic endometritis. It follows that the symptoms of chronic endometritis are overshadowed

by those of the primary cause. In early stages of tuberculous endometritis no symptoms arise and it is not until an advanced degree of tuberculous inflammation has been reached that a blood stained discharge develops.

The treatment of pyometra consists in dilating the cervix carefully under anaesthesia by means of metal dilators and in irrigating the cavity of the uterus with a mild antiseptic through a thin two way uterine catheter. If there is any suspicion of carcinoma either of the body of the uterus or cervical canal gentle curetting must be performed. A small rubber drainage tube should then be placed in the cervical canal and retained in position with a suture of thin catgut through the cervix. Manipulations of this kind in a case of pyometra must always be performed with gentleness and care because of the risk of perforating the uterus and spreading infection to the peritoneal cavity.

Until fairly recently, much confusion existed as to the incidence of chronic endometritis. It should be remembered that the correlation of ovarian function with menstruation was not established until the last world war and that the ovarian hormones have been identified only during the last twenty years. Cases of irregular uterine haemorrhage in the absence of physical signs in the pelvis were attributed to infections either of the endometrium or of the myometrium. For example, the secretory hypertrophy of the endometrium was regarded as a form of glandular endometritis and post menopausal atrophy was called atrophic endometritis. The cystic glandular hyperplasia of metropathia haemorrhagica was called polypoidal endometritis. It is for this reason that the older text books of gynaecology emphasised such conditions as chronic endometritis and chronic metritis.

The modern view is to regard a chronic endometritis in the absence of a persistent source of infection in the uterus, as an extremely rare condition. Its rarity is almost certainly determined by the exfoliation of the superficial layers of the endometrium which takes place during each menstruation. It is more than likely, however, that some degree of infection of the lower part of the endometrium of the body of the uterus is associated with chronic gonococcal cervicitis. But in such cases the cervicitis is the dominant feature of the case.

Senile endometritis should be regarded as a form of intermittent pyometra for it is doubtful if there is any clinical

group of cases of inflammation of the endometrium in elderly women not identifiable with pyometra

Cervicitis

Acute Cervicitis In septic abortion, puerperal sepsis and gonorrhœa, the cervix is acutely inflamed. When the cervix is examined through a vaginal speculum it is seen to be reddened, swollen with œdema, and mucus can be seen being discharged through the cervical canal. Not uncommonly tenderness is elicited by palpation of the cervix. In acute gonococcal cervicitis there is often a little backache and a feeling of fulness in the lower abdomen, which may perhaps be due to the acute inflammation of the cervix. In acute cervicitis, just as with acute endometritis, the symptoms and clinical course are overshadowed by those of the associated lesions of the disease. For example, in septic abortion and puerperal sepsis acute cervicitis is of less importance than endometritis with its risk of septicæmia, salpingitis, and peritonitis. Similarly, in acute gonorrhœa the acute inflammation of the cervix is apt to be regarded as only one of the associated lesions of the acute attack. Treatment of acute gonococcal cervicitis has already been described in Chapter VI, p. 118.

Chronic Cervicitis Chronic inflammation of the cervix is relatively common. The inflammation of the cervix is brought about by infection during abortion or child birth, and this method of infection accounts for the majority of cases at the present day. Lacerations of the cervix during child birth usually lead to some degree of chronic cervicitis, even if the patient escapes puerperal sepsis. For if the wound of the cervix does not heal cleanly by first intention there is a tendency for the edges of the laceration to become everted. In this way the cervical canal is made more patent and organisms can more easily ascend from the vagina and infect the cervical canal. Instrumentation may also lead to chronic cervicitis, particularly if the cervix is dilated rapidly with metal dilators and the cervix is split.

Infections of the cervix tend to persist as chronic infections. The mucous membrane of the cervical canal is rugose and the cervical glands are racemose in type, so that if organisms penetrate into the depth of the glands they are difficult to eradicate by local treatment to the cervical canal. Moreover, the mucous

membrane of the cervix is not exfoliated during menstruation, and there is no natural method of overcoming the infection such as is seen in the case of the endometrium of the body of the uterus. Chronic cervicitis therefore represents a form of focal sepsis. It causes vaginal discharge and, in some cases at least, sterility. The general effect of chronic cervicitis is important, for the latent infection may be responsible for metastatic infections such as arthritis, in addition to inducing diminished vitality.

Chronic cervicitis is usually associated with the presence of an erosion.

Erosion of the Cervix

Erosion of the cervix can be demonstrated only by inspection, for small erosions cannot be detected by palpation. An erosion takes the form of a reddened area around the external os. Most commonly, the reddened area is slightly raised above the level of the squamous epithelium of the vaginal portion of the cervix and is smooth and glistening. In such cases the erosion is covered by columnar epithelium similar to that lining the cervical canal, and the mucous membrane of the cervical canal is continuous with the columnar epithelium of the erosion. If the erosion is extensive, the covering epithelium may be thrown into folds when the erosion is described as papillary in type. In another form of erosion small follicles, or cysts, can be seen in the vicinity of the external os, the follicles being covered either by thin squamous epithelium or lying beneath an erosion of the papillary type.

Very rarely erosions are congenital. During intra uterine life the vagina and the vaginal portion of the cervix are lined by transitional epithelium, and this epithelium extends into the cervical canal until the sixth month. Towards the end of intra uterine life, columnar epithelium grows down from the cervical canal, and in one third of all new born female children extends to some degree over the vaginal portion of the cervix. If this condition persists until adult life the appearances of the vaginal portion of the cervix are those of an erosion, which is described as congenital in type.

The pathology of erosions of the cervix offers an extremely difficult problem and opinion is divided as to the interpretation of the histological appearances. It has been computed that 85 per cent of adult women, whether single or married, have

some degree of erosion of the cervix. It is further conclusively established that chronic cervicitis is an important factor in the causation of some erosions of the cervix.



FIG. 115. Erosion of the cervix. First stage. The squamous epithelium lies above and to the left, while to the right the squamous epithelium has been shed. Below this area the stroma of the cervix is packed with round cells.

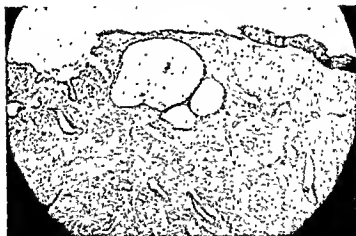


FIG. 116. Erosion of the cervix, showing a large eroded area beneath which lies a Nabothian follicle.

Erosion due to Chronic Cervicitis. In chronic cervicitis, pus and mucus are discharged from the cervical canal and bathe the posterior lip of the cervix if the uterus is retroverted, and the anterior lip if the uterus is anteflexed. The discharge is alkaline

and tends to produce maceration of the squamous epithelium. In chronic cervicitis the stroma of the cervix is oedematous and the resistance of the individual squamous cells around the external os reduced, so that after a time these desquamate and leave a raw red area denuded of epithelium around the external os. This represents the first stage in the development of an erosion. Microscopical examination shows that the tissues



117 A healing erosion. To the right and above lies normal squamous epithelium while to the left squamous epithelium has grown over the eroded area. To the right the squamous epithelium penetrates into one of the glands while the gland in the middle is becoming a distension cyst.

beneath the raw area are infiltrated with round cells and plasma cells. There is, however, no destruction of tissue, so that the appearances are not those of an ulcer. At a later stage the infected material beneath the raw area drains away, and, in the process of healing, columnar epithelium from the cervical canal grows over and covers the denuded area, so that macroscopically the red area is covered by smooth glistening translucent epithelium. In both stages the affected area around the external os is described as an erosion of the cervix and the erosion is called a simple flat erosion. After a variable interval, the squamous

epithelium of the vaginal portion of the cervix replaces the columnar epithelium of the erosion the squamous epithelium growing under the columnar epithelium and gradually pushing it away, until finally the squamous epithelium has completely grown over the eroded area. Unless the chronic cervicitis has been cured in the meantime, the process is repeated. In other words, chronic cervicitis leads to recurrent erosions of the cervix.

Papillary erosion is produced by columns of cervical stroma growing into the erosion from above, so that the surface of the erosion becomes ridged and furrowed. In this way pseudo glands are formed which may penetrate into the cervical



110-118 Erosion of the cervix. The squamous epithelium on the right comes directly into contact with the epithelium lining the glands. The stroma is infiltrated with round cells.

stroma. A follicular or cystic erosion is produced by the squamous epithelium occluding the mouths of these glands as it replaces the columnar epithelium of the erosion during the stage of pseudo healing. The blocked glands become distended with secretion and form the small cysts which can be seen with the naked eye, the so called Nabothian follicles.

The description given above explains the types of erosion due to chronic cervicitis, although in the opinion of some authorities papillary and follicular erosions rarely ensue upon chronic cervicitis.

Erosion due to Hyperplasia of the Mucous Membrane of the Cervix. Although it has been accepted for many years that erosion of the cervix is caused by chronic cervicitis there is good

reason to believe that many cases are not caused by a primary inflammation of the cervix, but are due to hyperplasia of the columnar epithelium of the cervical canal, which grows down to extend over the vaginal portion of the cervix, just as it does in the latter months of intra-uterine life. The interpretation of the histological appearances of an erosion may be difficult. If a patient has leucorrhœa of the fluor vaginalis type, an adenomatous erosion caused by hyperplasia may become infected by micro-organisms from the vagina. This type of erosion may then be regarded as being due to chronic cervicitis.



FIG. 119. Adenomatous erosion of the cervix.

It is difficult to believe that all erosions are caused by chronic cervicitis, for then one would have to assume that 85 per cent. of women have suffered from chronic inflammation of the cervix, which is highly improbable. Moreover, in large papillary erosions there may be no inflammatory reaction in the erosion itself, nor microscopical evidence of cervicitis on examination of the cervix. Again, proliferation of the mucous membrane of the cervical canal occurs frequently, and it is in this way that mucous polypi of the cervix are produced. It is extremely probable that the majority of erosions of the cervix of the papillary glandular type are caused by hyperplasia.

Hyperplasia of the mucous membrane of the cervix is manifested, not only by the development of mucous polypi and glandular erosions, but by a condition of adenofibrosis or adenomyosis, in which a multitude of Nabothian follicles form in the tissues lining the cervical canal. Little is known of the ætiology of these hyperplastic conditions of the cervix, for they are not usually associated with hyperplasia of the endometrium of the body of the uterus.

The modern tendency is to emphasise the frequency of erosions due to hyperplasia.

So far as erosions of the cervix are concerned, papillary and glandular erosions are mainly due to hyperplasia. Simple flat erosions, particularly when the squamous epithelium has



FIG. 120 Erosion of the cervix of the glandular type.

desquamated, are mostly due to chronic cervicitis. The hyperplastic erosions lead to an increased mucous discharge from the cervix, but the discharge is composed mainly of clear mucus. Nevertheless, the patient complains of the discharge, so that it is justifiable clinically to treat the cervix itself. It has already been emphasised that hyperplastic erosions may become infected by the vaginal bacteria, for the columnar epithelium has less resistance than the squamous epithelium which normally covers the vaginal portion of the cervix.

Ectropion

A cervix which has been badly lacerated during child-birth frequently shows the condition ectropion, when, as a result of lacerations, the lips of the cervix become everted and the mucous membrane of the cervical canal is not only exposed to

view, but grows down to a variable degree over the vaginal portion of the cervix. Ectropion can be detected by digital examination, for the external os is patulous, so that the lower part of the cervical canal can be felt, and very frequently the longitudinal columns which lie in the midline, both anteriorly and posteriorly, can be felt with the examining finger. Chronic cervicitis usually accompanies ectropion and the main symptom is vaginal discharge, which is of a muco purulent type.

Symptoms of Chronic Cervicitis and Erosion of the Cervix
The main symptom of cervicitis and erosion is vaginal discharge. Intelligent patients notice that the discharge contains mucus, and the muco purulent discharge can often be seen at the vulva. This discharge is quite different from the vaginal leucorrhœal discharges which have been described in Chapter VIII, for these discharges are profuse, yellow and fluid, and cause pruritus and vulvitis. With papillary erosions and vascular ectropions the patient may complain of vaginal hæmorrhage after coitus. In some cases vaginal bleeding may occur during defæcation. Erosions become very vascular during pregnancy, so that intermittent vaginal bleeding is frequently complained of. After the menopause, erosions show a tendency towards spontaneous healing, but they are sometimes infected in cases of senile vaginitis when they cause a bloodstained discharge. Cases of chronic cervicitis may lead to sterility if the purulent discharge is profuse. With chronic cervicitis the focal sepsis may lead to malaise and chronic ill health, and metastatic infections such as arthritis may be lighted up. Symptoms such as backache and vague abdominal pain may be attributed to chronic cervicitis in a small percentage of cases.

/ Diagnosis Chronic cervicitis and erosion can be detected with accuracy only by speculum examination of the cervix. Clinically, for the recognition of chronic cervicitis, a discharge of mucus and pus from the cervical canal must be present. A profuse discharge of clear mucus from the cervix is not evidence of chronic cervicitis, but is indicative of a hyperplastic condition of the cervical mucosa. In chronic cervicitis, the cervix is hard and firm, and appears more vascular than normal when examined with a speculum. Care must be taken to distinguish between a vaginitis involving the vaginal portion of the cervix and a true endocervicitis, for it is not uncommon, in some forms of leucorrhœa, for small red areas to be distributed over the vaginal portion of the cervix.

A typical erosion is soft to touch with a tendency to bleed easily. If the erosion is covered by columnar epithelium the surface is smooth and glistening and bright red in colour. It must be distinguished from an early carcinoma of the cervix, and if there is any doubt a biopsy must be performed. A carcinoma of the cervix, except when papillary in type, is indurated, friable, and bleeds very easily (Chapter XXI, p 493).

A primary sore of the cervix may be difficult to distinguish from either an erosion or an early carcinoma, for its characters are intermediate between those of the other two conditions. It should always be borne in mind if a red area is found on the cervix which is vascular, denuded of epithelium, yet without excavation of the cervical tissues. Tuberculosis of the cervix is a rare disease which may be difficult to distinguish from carcinoma of the cervix, but with advanced tuberculosis, caseous material can be seen in the deeper part of the ulceration. A method of distinguishing between carcinoma of the cervix and erosion has been described by Schiller. The cervix is painted with Lugol's solution and examined through a speculum. In early carcinoma of the cervix the malignant cells do not assume the brown stain with iodine and the cervix appears to be stippled with small grey areas. In erosions, the columnar epithelium does not take up the iodine and the eroded area appears bright red. With the ulcerating growths found later in the course of carcinoma of the cervix, these appearances are not found because of the ulceration.

Even under the microscope, there may be great difficulty in distinguishing between an early carcinoma and an erosion, for with healing erosions the squamous epithelium often grows deeply along the glands into the tissues of the cervix. Also, there is frequently some degree of hyperkeratosis which may cause difficulty. A skilled pathologist alone can give an opinion in difficult cases of this kind.

Treatment of Chronic Cervicitis

The application of antiseptics to the cervical canal seldom results in permanent cure of chronic cervicitis for the infection is deep seated in the cervical glands and the antiseptics do not penetrate so far. The principles of treatment of chronic cervicitis have already been indicated to some extent in the section dealing with gonorrhœa (Chapter VI). In mild cases

of cervicitis temporary improvement follows the application of strong antiseptics, such as a solution of Tr. Iod. Fortis 6 drams, glycerine 2 drams. Strong solutions of picric acid in spirit, 10 per cent. formalin, and iodised phenol, are also of service in such cases. The applications should be made at least twice a week. The cervix is exposed with a speculum and swabbed clear of mucus with wool soaked in a solution of sodium bicarbonate. Mucus should be cleared from the cervical canal with wool wound round a Playfair's probe soaked in the bicarbonate solution. The cervical canal and cervix are then dried and the cervical canal swabbed with the antiseptic. Any erosion present should be painted with the antiseptic solution. The patient should douche herself with a solution containing

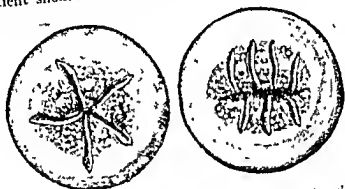


FIG. 121. Methods of cauterisation of the cervix for cervical erosion and chronic cervicitis.

sodium bicarbonate twice daily during the treatment. It is found, in practice, that some degree of improvement follows fairly soon upon this treatment, but *permanent* cure is only very rarely obtained. The cervical canal may be cauterised chemically with silver nitrate or zinc chloride solutions, but the chemical method of cautery is unsatisfactory. A thermal cautery under anaesthesia is a valuable method of treatment in some cases. The patient is anaesthetised and placed in the lithotomy position and the erosion is first cauterised with a paquelin cautery. Then the cervical canal is cauterised, followed by linear cauterisation of the cervix. Success has been reported from the application of radium to the cervical canal; 25 mgm. of radium element being retained in the cervical canal for eight hours.

Extremely good results, particularly in cases of chronic

gonococcal cervicitis, are obtained by the application of diathermy to the cervix. The advantage of the diathermy method is that its effects are not restricted to the cervical canal, but the cervical tissues at some distance from the canal are heated, and in gonorrhoea the organisms are destroyed. Diathermy treatment, however, must be carried out at least twice a week for about eight weeks, before a final result is obtained. Ionisation is not so satisfactory as diathermy in the treatment of chronic cervicitis.

Operative treatment of chronic cervicitis aims at excising as much as possible of the infected tissues. The type of operation performed depends upon the type of case. A total amputation of the cervix is hardly ever necessary.

The results of surgical treatment of chronic cervicitis are good, but if much of the cervix is removed or if thick scar tissue forms in the cervix, subsequent parturition may be difficult. The indications for surgical treatment in chronic cervicitis are well defined. If the cervix is badly lacerated with ectropion, the operation of trachelorrhaphy, which consists of partial amputation and repair is clearly indicated. Similarly, if there is well marked chronic cervicitis which has failed to respond to conservative measures, surgical treatment is clearly indicated. If the cervix is eroded by a glandular erosion of the hyperplastic type, the best results follow partial amputation. If, however, the cervix is not lacerated and the erosion is small, one would be inclined to press conservative measures rather than to employ surgery.

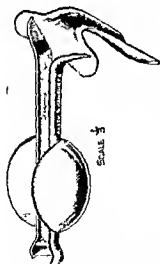


Fig. 120. Auvar's self retaining vaginal retractor

Many operation methods for repair and partial amputation of the cervix have been described, but the principles are the same in all. The first object is to excise as much as is possible of the mucous membrane of the cervical canal, of the racemose glands of the cervix, and of the eroded areas of the vaginal portion.

In consequence, a cone shaped piece of cervix is removed, the apex of the cone extending almost as far upwards as the internal

os, the base of the cone being represented by part of the vaginal portion of the cervix. The second objective is to cover the bare area with flaps of healthy tissue obtained from the anterior and posterior lips of the vaginal portion of the cervix. If the cervix can be pulled down the operation can be performed easily, although it is always extremely difficult to obtain neat apposition. If, however, the cervix is high up and the vagina small, partial amputation of the cervix is often an extremely difficult operation.

Technique. The patient is prepared for operation in the usual way, the vulva is shaved, and vaginal douches are given

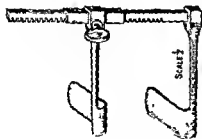


FIG. 122A. Jayle's vaginal retractor.



FIG. 123. The cervix is eroded. The black lines show the position of the incisions made in the operation of trachelorrhaphy.

during the twenty-four hours prior to operation. The patient is anaesthetised and placed in the lithotomy position. An Auvard speculum is placed in the vagina and a lateral vaginal retractor, such as Jayle's, introduced to expose the cervix. The cervix is pulled down with two volsellum forceps, one on the anterior lip and the other on the posterior lip. The cervix is now dilated with Hegar's dilators. A transverse incision, slightly curved downwards, is then made through the epithelium of the anterior surface of the cervix well above the level of the erosion and a short flap is dissected away from the cervix in this way. A similar incision is made on the posterior lip of the cervix. The extremities of the two incisions meet on each side

of the cervix The next step is to make a lateral incision on each side which passes from the external os, deeply through the

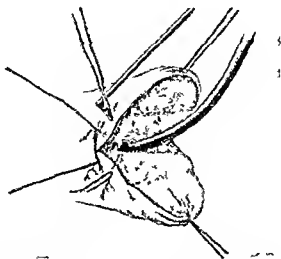


FIG 121 Partial amputation of cervix Note (a) that the cervical canal is dilated (b) the lateral sutures (From Eden and Lockyer)

cervical tissues, to reach the lateral limits of the incisions

previously made (see Fig 123) The next step is to excise the cervical tissues marked out by the incisions The anterior lip of the cervix is incised through the original incision by cutting obliquely upwards and backwards until the upper part of the cervical canal is reached in the midline and then passing the scalpel laterally on each side to the limits of the original incision The piece of cervix is shaped like half a cone and contains most of the mucous membrane of the anterior wall of the cervical canal A similar procedure is then carried out with the posterior lip of the cervix The variations in the methods of partial



FIG 122 Partial amputation of cervix The method of covering the raw areas (From Eden and Lockyer)

amputation depend upon the way in which the piece of cervix is removed In Schroeder's method, which is sometimes

employed, the piece removed is not cone shaped but rectangular, and an ingenious method is used to obtain good apposition.

The next stage of the operation is to control hemorrhage, which is often extremely profuse. Catgut sutures are inserted,

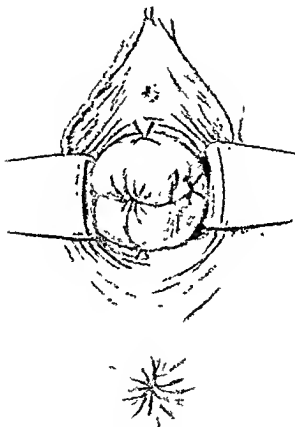


FIG. 123 Partial amputation of cervix. Completion of operation.
(From Eden and Lockyer)

deeply through the cervical tissues in a radial direction, and these serve to control most of the bleeding from the cut surface of the cervix. It is much better, however, to adopt sound surgical principles and to ligature the cervical branches of the uterine artery separately. These vessels can be clamped quite

easily as soon as the flaps are fashioned, before the pieces are removed from the anterior and posterior lips of the cervix. If the cervix is drawn forcibly over to one side the vessels which descend from the uterine artery on the lateral aspect of the cervix can be seen and clamped. After the partial amputation of the cervix, the tissue enclosed by the clamps is ligatured separately and in this way good hæmostasis is obtained.

After all oozing from the cervix has been controlled the next step is to cover the raw surface of the cervix. The most satisfactory method is to invaginate the anterior and posterior flaps into the cervical canal with special sutures (Fig 125). The lateral extremities are then sutured together with sutures passed deeply through the flaps and the cervical tissues.

The operation for partial amputation of the cervix is often difficult to perform. Extreme care must be taken to obtain absolute hæmostasis, otherwise reactionary hæmorrhage of a severe degree may develop when the effects of the anæsthetic have passed off, and the blood pressure rises. After operation the vagina should always be packed tightly with dry sterile gauze to control any oozing which may occur, the packing being removed twenty four hours afterwards. Another complication is secondary hæmorrhage. Chronicised twenty day catgut should be used during the operation. The majority of secondary hæmorrhages are caused by sepsis, and if the patient develops vaginal discharge at the end of the first week after operation, the vagina should be irrigated with an antiseptic douche. Sulphanilamide or sulphapyridine should be given by mouth. Secondary hæmorrhage is treated by placing the patient under full anæsthesia and washing away blood clot from the vagina. If bleeding points can be seen, hæmorrhage should be controlled with deep sutures passed through the cervical tissues, otherwise the vagina should be packed tightly with dry sterile gauze.

The end results of trachelorrhaphy are good, provided that cases are selected with care. Much cannot be hoped from the operation of trachelorrhaphy if the leucorrhœa complained of is due to a trichomona vaginitis. It is important to dilate the cervix at the beginning of the operation and to ensure that the cervical canal is patent at the end of the operation, otherwise a hæmatometra may be produced from stenosis of the cervical canal. Again, scarring of the cervix may lead

to slow dilatation of the cervix in a subsequent labour, and this possibility must always be considered before the operation is advised. Experience shows that partial amputation of the cervix, if performed carefully and neatly, does not usually cause trouble in a subsequent child birth. Small granulations are apt to develop around the external os after the operation and these should be treated by cauterisation with solid silver nitrate.

The Treatment of Hyperplastic Conditions of the Mucous Membrane of the Cervix

The treatment of glandular erosions due to hyperplasia of the mucous membrane of the cervical canal is usually surgical. The application of antiseptics is useless and thermal cauterization unsatisfactory. Chemical cauterization with zinc chloride has been reintroduced and some success may be achieved by this method of treatment. Surgical treatment consists in trachelorrhaphy and excellent results are obtained. On the other hand, some patients are content to control the vaginal discharge with alkaline douches rather than to undergo surgical treatment.

Metritis

Acute Metritis Some degree of inflammation of the myometrium accompanies the acute endometritis of puerperal sepsis and septic abortion. In severe cases of uterine sepsis a well marked metritis with infiltration with leucocytes, and œdema may develop, when the uterus becomes enlarged and tender. In severe streptococcal infections the organisms may penetrate through the wall of the uterus into the parametrium and peritoneal cavity. It is probable that the acute metritis accompanying puerperal sepsis clears up completely and leaves no permanent damage to the myometrium. Histological examination of the myometrium in these cases fails to demonstrate evidence of chronic inflammation. At one time it was believed that the symptoms were caused by arteriosclerosis of the uterine vessels. The pathological changes in the uterus were also regarded as being due to delayed involution of the uterine vessels after child-birth, because elastic tissue was found in excess around the uterine vessels. Very rarely, multiple small abscesses may form in the myometrium and, very rarely,

indeed, the inner surface of the whole cavity of the uterus may slough away and be discharged from the vagina and vulva—in the condition called *metritis exfoliata*—and yet the patients survive.

Chronic Metritis. Pathologically, there is little, if any, evidence that a chronic inflammation of the myometrium, apart from the very rare tubercular and syphilitic forms, is frequently seen. The term *chronic metritis* was originally used for a clinical group of cases in which the dominant symptoms

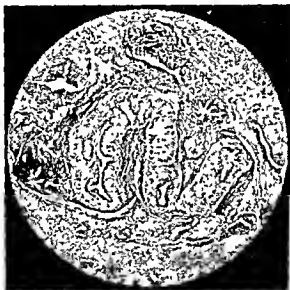


FIG. 127. An artery in the wall of a multiparous uterus. The black areas illustrate the distribution of elastic tissue. Elastic tissue has been deposited plentifully around the veins.

were irregular and profuse hæmorrhage, backache, and discharge. The uterus was often found to be bulky, and not infrequently its consistence was firmer than normal. It has been shown, however, that the elastic tissue content of the uterus is increased after each pregnancy and that the normal result of pregnancy, so far as the myometrium is concerned, is for there to be a deposition of elastic tissue around the arteries and veins of the myometrium, and also beneath the peritoneal surface of the uterus. The increase in the amount of elastic tissue is to be regarded as a physiological process, and there is no reason to believe that the deposition of elastic tissue is

determined in any way by subinvolution. It has been shown that the elastic tissue content of the uterus varies according to the parity of the woman, and in this way the firm bulky uterus of the multipara can be explained. It is not uncommon to find a large deposition of elastic tissue in the uterus of a multipara without the patient having had any gynaecological symptoms whatsoever.

The involution of the vessels of the puerperal uterus is a highly complex process. The lumen of the vessel is reduced by proliferation of the subendothelial tissues. In the case of the media of the vessel, the muscle cells undergo granular atrophy, and in the case of sinuses and veins there is well marked hyaline degeneration. At a later stage in the process of involution, elastic tissue is deposited in the adventitia and the hyaline tissue is absorbed. The internal elastic lamina becomes thicker and is often laminated.

The cases which were formerly described under the term chronic metritis are now regarded as being due in the main to ovarian disturbances and are exemplified by metropathia hæmorrhagica, polymenorrhœa, and the other types of irregular hæmorrhage described in the previous chapter. There is very little pathological evidence that either a chronic inflammation, a fibrosis of the myometrium, arteriosclerosis of the uterine vessels, or delayed subinvolution are processes responsible for the causation of the symptoms of cases of this group. It is much more scientific and much more serviceable clinically to classify the cases according to the scheme outlined in the previous chapter.

It should also be remembered that some degree of chronic myometritis is associated with chronic inflammations of the pelvis, such as adnexal inflammation, parametritis, pyometra, and degenerate new growths of the uterus. But in all such cases the chronic myometritis is of secondary importance compared with the primary cause.

CHAPTER XVIII

PROLAPSE

THE normal position of the uterus is one of anteversion and anteflexion with the body of the uterus tilted forwards so that it lies almost horizontally when a woman assumes the erect posture. Normally, when a woman strains there is no descent either of the vaginal walls or of the uterus. In prolapse, straining causes protrusion of the vaginal walls at the vaginal orifice, while in severe cases the cervix of the uterus may be pushed down to the level of the vulva. In extreme cases the whole uterus and the whole of both vaginal walls may be extruded from the vagina.

Prolapse is a common complaint, and severe cases mostly arise in women of menopausal age who have borne children. The inconvenience of the prolapse is accompanied by micturition symptoms, by backache, and by a sense of weakness in the region of the perineum. The causation of prolapse is difficult to understand without a knowledge of the anatomy of the pelvic floor and of the ligamentary supports of the uterus and vagina. Moreover, the treatment of prolapse must be based upon attempts to restore the normal anatomical relations.

ANATOMY OF THE PELVIC FLOOR

The pelvic floor consists, in the main, of the two levator ani muscles. When examined from above, after the removal of the pelvic viscera, the upper surfaces of the levator ani muscles are seen to be covered by a dense layer of pelvic fascia. In the midline, the pelvic floor is pierced by the urethra, the vagina and the rectum. The levator ani muscle consists of three parts, the pubo-coccygeus, the ilio-coccygeus, and the ischio-coccygeus. The ischio-coccygeus muscle—the coccygeus muscle of the anatomists—arises from the spine of the ischium and spreads out in a fan shaped manner backwards and upwards to be

inserted into the front of the coccyx. The ilio-coccygeus arises from the "white line" on the lateral wall of the pelvis, directly from the pelvic fascia, and passes backwards and inwards, to be inserted partly into the tip of the coccyx and also into the raphe, which passes from the rectum to the tip of the coccyx. The pubo-coccygeus muscle is the most important of the three. It

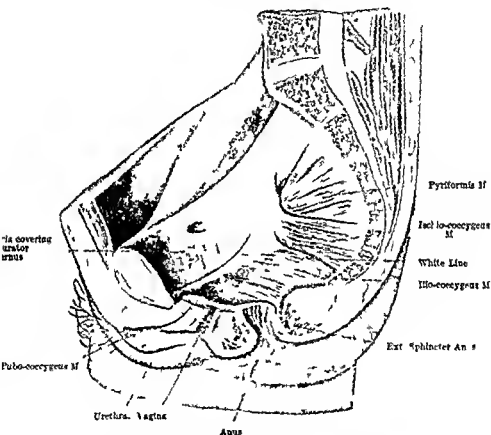


FIG 128 The pelvic floor. A median sagittal section through the pelvis (Vest Stoeckel)

arises from the back of the pubic ramus and passes backwards to be inserted, partly into the tip of the coccyx, and partly into the raphe which passes between the rectum and the coccyx. Some of the inner fibres of the pubo-coccygeus (the pubo rectalis muscle) decussate behind the rectum at the level at which the rectum turns sharply backwards to form the anal canal. These fibres act as a sling to the rectum and probably have some sphincteric action. The innermost fibres of the pubo-coccygeus

surface of the pubo coccygeus, and it is difficult to believe that the muscles of the pelvic floor can directly support the anterior vaginal wall. On the other hand, the posterior vaginal wall is more directly supported by the levator ani muscles, for the decussating fibres extend upwards to a level of about one third

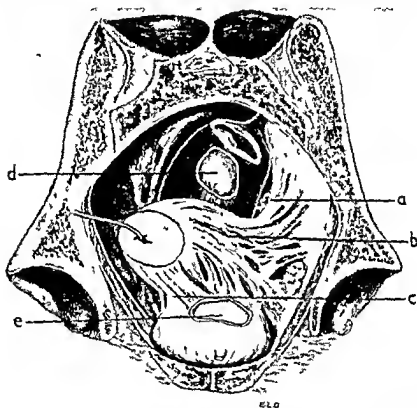


FIG 130 Retinaculum uteri (a) Utero-sacral ligament, (b) Mackenrodt's ligament, (c) the vesico-uterine ligament, (d) the peritoneum covering the sigmoid colon, (e) the peritoneum covering the bladder (After Halban Seitz)

of the length of the posterior vaginal wall. Although the direction of the vagina is upwards and backwards, the vagina is always inclined at an acute angle with respect to the pelvic floor, so that the levator muscles cannot, on anatomical grounds, be regarded as affording a direct support. Moreover, the cervix and uterus, which lie on a still higher plane, are, again, not directly supported by the pelvic floor.

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In spite of the above considerations, injury to the muscles of the pelvic floor and laxity of the individual muscles are undoubtedly important factors in the causation of the prolapse. Both factors, injury and atony, cause the hiatus urogenitalis to become patulous, so that protrusion of the vagina or uterus through the hiatus is more easily accomplished.

The Ligamentary Supports of the Uterus and Vagina. There is no reason to believe that the round ligaments support the uterus in the pelvis, for they are never found tense and stretched at operation, and from their direction they can be of little service except to maintain ante flexion. The round ligaments may, however, be deliberately shortened by operation, so that the uterus is forcibly ante flexed. The broad ligament, consisting of thin sheets of peritoneum, serves no purpose in the support of the uterus.

The uterus and vagina are supported almost entirely by the pelvic cellular tissue, which tends in various situations to form ligaments. The anatomy of the pelvic cellular tissue is extremely difficult, and although it may be convenient for morphologists and anatomists to regard the pelvic cellular tissue as areolar tissue which fills up empty spaces around the pelvic viscera between the peritoneum above and the pelvic fascia below, a much more detailed knowledge is required in gynaecology. Above the level of the layer of the pelvic fascia which covers the cranial surface of the levator ani muscle, the pelvic cellular tissue is condensed around the vagina and cervix to form ligamentary supports. The most important of these passes laterally from the lateral aspect of the vagina and cervix, outwards to the wall of the pelvis to form what is termed Mackenrodt's ligament, or the cardinal ligament of the uterus, or, again, the transverse cervical ligament.

Mackenrodt's ligament lies below the level of the uterine vessels and passes out in a fan shaped manner towards the pelvic wall. It consists of cellular tissue with a little plain muscle, and contains sympathetic nerve fibres, lymphatics and veins. The posterior part of the fan shaped condensation passes upwards, lateral to the rectum to the sacrum, and is termed the utero sacral ligament. It is important to remember, however, that Mackenrodt's ligament and the utero sacral ligament arise mainly from the lateral aspect of the vagina rather than mainly from the cervix of the uterus. In front, passing from the front of the cervix to the base of the bladder, are fibres of the same

system, which are best referred to by the term vesico-uterine ligament. Normally, these condensations of the pelvic cellular tissue, which are perhaps best referred to under the term retinaculum uteri, afford the main support of the uterus and the upper part of the lateral vaginal wall, for the condensations not only fix the uterus and upper part of the vagina to the lateral

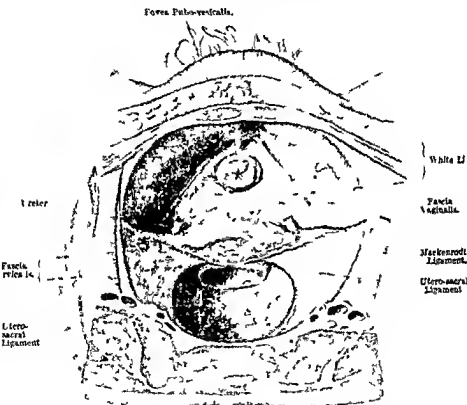


FIG. 191 The pelvic fascias seen from above (Peham Amreich)

walls of the pelvis, but also fix them to the bladder and to the pelvic fascia covering the upper surface of the levator ani muscle. None of these supports is peritoneal. The utero sacral ligaments, although following the direction of the utero sacral folds of peritoneum, lie well below the horizontal level of these peritoneal folds.

The supports of the anterior vaginal wall are quite different from those already mentioned, and are, again, extremely difficult to understand. The vagina and the bladder are each

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surrounded by a layer of fascia, which is simply a condensation of the pelvic cellular tissue. The vaginal fascia is normally well developed, containing plain muscle tissue. The vesical fascia, on the other hand, is much thinner and of less importance. Normally, a plane of cleavage, the vesico-vaginal space, can be

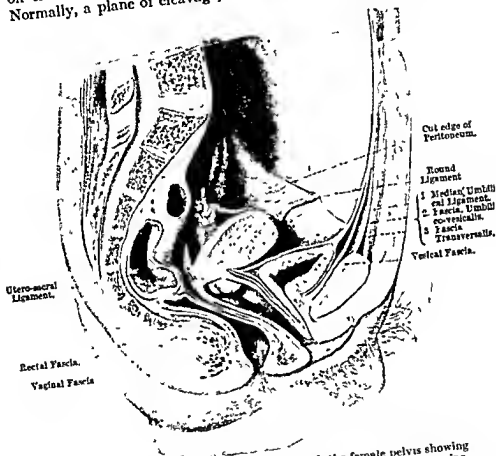


FIG. 132. A median sagittal section through the female pelvis showing the connective tissue sheaths of the bladder, rectum and vagina. The vaginal fascia and the vesical fascia are separated by the vesico-vaginal space. Below, the vaginal and vesical fascias fuse. Above both fascias are adherent to the cervix. (Peham-Amreich)

defined between the vaginal fascia and the vesical fascia in the region of the upper third of the anterior vaginal wall. In the lower part of the anterior vaginal wall the vesical and vaginal fascias fuse in the region of the internal urinary meatus. In the region of the upper part of the anterior vaginal wall the vaginal fascia and the vesical fascia join with the front of the cervix to

form the vesico uterine ligament. In other words, if the vesico uterine ligament is traced downwards from the cervix it will be found to fuse in front with the vesical fascia, yet to be continued downwards along the anterior vaginal wall as the vaginal fascia. Laterally, these fascial layers extend as downward prolongations of Maekenrodt's ligament. These fascial layers are easily recognised during the operation of anterior colporrhaphy. In this operation, after the vagina has been incised, the vaginal fascia is next exposed. After the vaginal fascia has been cut through, the vesico vaginal space is opened up, and if the cervix is pulled down, the vesico uterine ligament can be seen passing between the bladder and the front of the cervix of the uterus, and the ligament is always best developed laterally. These anatomical considerations show that the anterior vaginal wall is supported —

(1) By the attachment of the vagina to the cervix of the uterus

(2) By the attachment of the vaginal fascia by means of the vesico uterine ligaments to the front of the cervix

(3) By the attachment of the vaginal fascia to the vesical fascia (a) above through the vesico uterine ligament and (b) below directly in the region of the internal urinary meatus

(4) Laterally, on each side the vesical and vaginal fascias fuse with the downward prolongation of Maekenrodt's ligament

(5) The bladder itself directly supports the anterior vaginal wall, and if the bladder is fixed firmly in position by its true ligaments to the back of the symphysis pubis and by the lateral ligaments which fix it to the anterior extension of Maekenrodt's ligament, the bladder of itself directly supports the anterior vaginal wall. It must be realised that the vesico-vaginal space is well defined only in cases of prolapse. In a normal woman the space is small.

Supports of the Posterior Vaginal Wall Prolapse of the posterior vaginal wall is rarely of the same degree as prolapse of the anterior vaginal wall, probably because the intra-abdominal pressure is directed more anteriorly than towards the pouch of Douglas. Again, the utero-sacral ligaments pass laterally from the upper part of the lateral walls of the vagina, and maintain the posterior vaginal wall in its position. Just as with the anterior vaginal wall, there is a vaginal fascial layer and also a layer of fascia covering the rectum, but the recto-vaginal space is looser and laxer and more extensive than the vesico vaginal space.

Ætiology of Prolapse

The modern tendency is to attribute more importance to asthenic states in the causation of prolapse than was formerly the case. It is generally admitted that injury during childbirth is one of the most important ætiological factors, but due emphasis has not always been placed upon the effects of visceroptosis and asthenia. With a complete perineal tear, even when the whole perineal body has been torn through, prolapse of the vaginal walls is almost unknown, so that injury of itself does not necessarily lead to prolapse of the vaginal walls or of the uterus. Probably a patient with a complete perineal tear exercises her levator muscles continuously, and to an extreme degree, in order to obtain some sphincteric control over the rectum, and in this way tones up not only the muscles of the pelvic floor but all the ligamentary supports in the pelvis.

Again, it is well known clinically that most patients with prolapse are women of menopausal age, when, as a result of the menopause, the tissues become slack and there is less support for the vagina and uterus. Clinical experience also shows that many women who develop minor degrees of prolapse immediately after childbirth have slack abdominal and pelvic muscles with lax vaginal walls and a retroflexed uterus, yet if these women exercise their muscles and improve their general muscular tone the prolapse in time becomes less severe.

The importance of these clinical observations is that they confirm the anatomical descriptions which have been given above. Prolapse of the uterus and the anterior vaginal wall is mainly due to laxity of the pelvic cellular tissue supports, resulting partly from asthenia and partly from stretching and injury during childbirth. The typical patient who complains of prolapse is the woman aged about 50, who has given birth to several children, and who usually gives the history of a perineal tear or of a difficult confinement or of the birth of large children. There are signs of an old tear of the perineum, the vaginal orifice is relaxed, the hiatus urogenitalis is patulous, and the paravaginal tissues are slack. In the typical case of prolapse, therefore, many causal factors can be demonstrated; only exceptionally can a single isolated cause of the prolapse be found. Prolapse in young virgins is seen in cases of spina bifida occulta and split pelvis. It develops from time to time in virgins of menopausal age with extreme asthenia, when there is

well marked visceroptosis. The majority of patients, however, give a history of difficult delivery, although the symptoms may not become well marked until the woman reaches the age of the menopause. Amongst the predisposing abnormalities of childbirth, which tend to cause subsequent prolapse, are —

The Application of Forceps prior to Full Dilatation of the Cervix Traction on the forceps pulls down the cervix and stretches both Mackenrodt's ligaments and the utero sacral ligaments. If the ligaments are stretched to an extreme degree, however well the pelvic cellular tissue may involute after childbirth, it is unlikely that the ligaments will regain normal tone, so that the uterus with an abnormal degree of mobility tends to be pushed down into the vagina each time the patient strains.

Lacerations of the Perineal Body When the perineal body is lacerated during childbirth, unless the torn and retracted



FIG. 177. Diagram to illustrate the effect of laceration of the perineal body with division of the decussating fibres of the bulbocavernosus.

muscles are brought into accurate apposition by immediate suturing, the hiatus urogenitalis will become patulous. A mistake which is frequently made is to omit examining the posterior vaginal wall for a laceration after delivery. Although neither fourchette nor the skin of the perineum may be torn, it is not uncommon for the lower third of the posterior vaginal wall to be lacerated during childbirth, and for the muscles of the perineal body to be severed and to retract laterally. Unless the practitioner investigates his case for tears of this kind there will be a subsequent tendency to prolapse, although the perineal body is superficially intact.

The Passage of Large Children through the Birth Canal This stretches the surrounding tissues, and if these tissues fail to involute normally and lose their tone, there will be a tendency for the vaginal walls to prolapse at a later date.

Ill-health and Malaise This is a very common cause of

prolapse following childbirth The modern tendency is to insist upon puerperal women taking regular exercises and massage from the third day of the puerperium, in order to improve the muscle tone Where the patient remains in bed for a long time after a normal confinement without exercises, and then when she gets up is worn out by lactation, fatigue and sleeplessness, and particularly if the delivery has been difficult, with injuries in the pelvis or subsequent inflammation, the general health may suffer and the patient become listless and fatigued The pelvic muscles become slack, the cellular tissue in the pelvis becomes lax, and there is a tendency for immediate prolapse

A Rapid Succession of Pregnancies This tends to produce prolapse in the same way

Asthenia and Visceroptosis It is well established that asthenic patients are the most prone to develop prolapse At the menopause and for some years afterwards the tissues in the pelvis lose their tone, and the uterus and vagina obtain an increased mobility, so that when the abdominal pressure is raised during coughing and straining there is a tendency for these structures to prolapse Most patients with prolapse have a well marked degree of visceroptosis and their abdominal musculature is poor At the present day it is believed that asthenia is one of the most important factors in inducing prolapse

Similarly, chronic bronchitis, large abdominal tumours, and constipation tend to aggravate any degree of prolapse which may be present

THE ANATOMY OF PROLAPSE

Cystocele Prolapse of the anterior vaginal wall is seen most frequently When the patient strains, the upper part of the anterior vaginal wall descends, and in advanced cases may protrude outside the vaginal orifice In such cases the vaginal and vesical fascias are thinned out and fail to support the bladder, so that the bladder prolapses with the anterior vaginal wall This condition is termed cystocele In mild cases the lower part of the anterior vaginal wall does not prolapse and the urethra is supported by the fascial tissues which intervene between the urethra and vagina, and which are themselves attached to the back of the pubis It is not uncommon in cases of cystocele to be able to distinguish a transverse ridge at the level of the sphincter urethra muscle which indicates how the

urethra is supported at this situation. Nowadays it is customary to describe prolapse of the lower third of the anterior wall as urethrocele. It is important to distinguish urethrocele on clinical grounds because it gives rise to the symptom of imperfect control of micturition. In cystocele the anterior vaginal wall is stretched and thinned out except when the cystocele

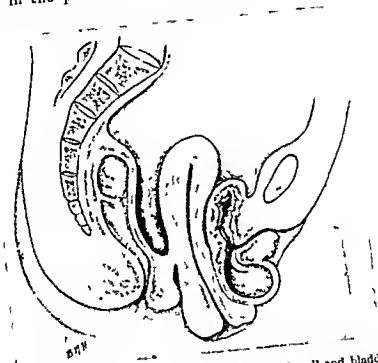


FIG. 124. Complete procidentia. Endstage of the third degree. Notice that the whole of both vaginal walls lie outside the vaginal orifice. The whole of the uterus also lies below this level. Clearly the ligamentary supports of the uterus must be greatly stretched to allow such a degree of prolapse. (Compare Fig. 123)

protrudes outside the vulva, when, owing to friction, the epithelium becomes thickened and hypertrophied.

Prolapse of the Uterus. A mild degree of cystocele may be present without prolapse of the uterus. On the other hand, if the uterus prolapses, there is always some associated descent of the anterior vaginal wall. It is customary to describe three

degrees of prolapse of the uterus. In the first, the cervix descends into the vagina; in the second, the cervix descends to the level of the vulva, while in the third degree the cervix protrudes outside the vaginal orifice. In complete procidentia, the whole uterus protrudes outside the vulva, bringing with it both vaginal walls, and it may be possible to feel coils of small intestine in the pouch of Douglas outside the level of the



110 135 Prolapse of the cervix, anterior vaginal wall and bladder. The cervix is elongated and hypertrophied. The anterior vaginal wall and bladder have prolapsed outside the vaginal orifice. The cervix is also prolapsed. In this case the ligamentary supports hold up the body of the uterus. Compare Fig 134

vaginal orifice. If the uterus prolapses it is usually found to be retroverted and retroflexed, the retroversion being determined by the accompanying asthenia and visceroptosis. In most cases the vaginal portion of the cervix is hypertrophied, and in third degree of prolapse of the uterus the epithelium covering the cervix is thickened and it is not uncommon for trophic ulcers to form both on the cervix and on the prolapsed anterior vaginal wall.

In prolapse of the uterus, the supra-vaginal portion of the

cervix is sometimes elongated. It is believed that supra-vaginal elongation of the cervix is caused by venous stasis induced by the descent of the cervix. It is also possible that the cranial part of Mackenrodt's ligament supports the upper part of the cervix and that only the caudal portion of the

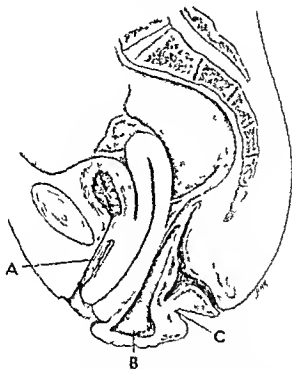


FIG. 130. Prolapse of the pouch of Douglas. The body of the uterus is supported by ligaments but there is well marked supravaginal elongation of the cervix. A indicates the position of the anterior fornix, B the pouch of Douglas prolapsed outside the vaginal orifice and C the junction of the posterior vaginal wall with the perineum.

retinaeculum uteri is slackened. Supra vaginal elongation of the cervix must be distinguished from congenital vaginal elongation, in which the fornices are deep and the elongation is restricted only to that portion of the cervix which projects into the vagina.

Prolapse of the Posterior Vaginal Wall Prolapse of the posterior vaginal wall is not so frequent as cystocele. It is

usually associated with well marked injury to the perineal body. Usually only the posterior vaginal wall prolapses, for the rectum is not so adherent to the vagina as is the bladder. In rectocele



FIG. 137 Prolapse of the uterus. The hypertrophied cervix prolapses through the vaginal orifice. The cervix is lacerated and eroded.

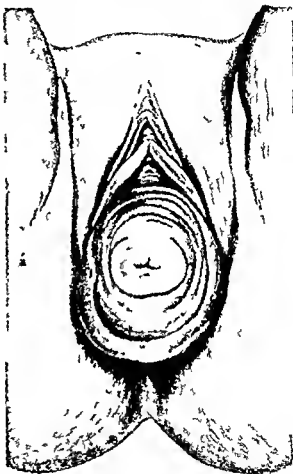


FIG. 138 Complete procidentia. The cervix and the whole of both vaginal walls protrude outside the vulva. The pouch of Douglas is also prolapsed.

the rectum protrudes with the posterior vaginal wall, but the condition is relatively uncommon. In rectocele the tissues which normally intervene between the posterior vaginal wall and the rectum must have been torn by obstetrical injury, and the vagina and rectum must be adherent by scar tissue. One of

the worst forms of prolapse is when the pouch of Douglas prolapses. Clinical experience shows that most cases follow the operation of ventri-fixation for prolapse. In prolapse of

the pouch of Douglas it is not uncommon for the upper part of the posterior vaginal wall to protrude outside vulva and for coils of the intestine to be palpated in the prolapsed part.

If a woman with prolapse is examined and asked to strain down, the usual sequence of events is for the anterior wall to protrude first, to be followed by the cervix, and then by the posterior vaginal wall.

Symptoms of Prolapse

In prolapse the patient complains of something descending in the vagina or of something protruding either at the vulva or externally. The prolapse is aggravated by straining and coughing, and by exercise. Often the patient states that the prolapse reduces itself

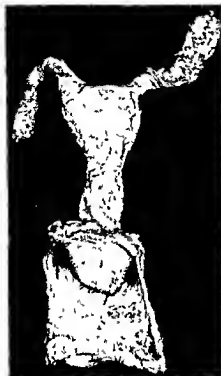


FIG. 189. Supra vaginal elongation of the cervix from a case of prolapse.

when she lies down. If there is a large prolapse, the external swelling may inconvenience the patient in walking and in carrying out her everyday duties. Even in mild cases patients are conscious of a sense of weakness and of a lack of support around the perineum, and sensitive women may complain of this sense of weakness and the loss of confidence thereby induced before they are aware of anything prolapsing.

Prolapse is always associated with backache, situated over the sacrum, which can be attributed to stretching of the pelvic cellular tissues as the vagina and uterus descend. Abdominal pain is not a predominant symptom, although some women suffer from what they describe as a bearing-down feeling above the pubes.

In all cases of prolapse there is some degree of vaginal discharge. The discharge may emanate from a chronically inflamed lacerated cervix, but most usually it is caused by the relaxation of the vaginal orifice (see p. 188) which allows foreign organisms to invade the vagina and produce a mild degree of vaginitis.

Some of the most important symptoms of prolapse are micturition disturbances. The most frequent is imperfect control of micturition, so that when the patient laughs or coughs or in any way raises the intra-abdominal pressure, urine dribbles away from the urethra. This imperfect control of micturition is caused by a lack of support to the sphincter muscle of the urethra. Frequency of micturition is again a common symptom caused in some cases by chronic cystitis and in others by irritability of the bladder due to displacement. In severe degrees cystocele patients frequently complain that they have difficulty in performing the act of micturition and that the more they strain the less easily can they pass urine. The explanation of this symptom is that when the intra-abdominal pressure is raised in straining, the bladder is pushed down in the cystocele so that most of the bladder lies below the level of the external meatus. Patients usually offer the information that they can only empty the bladder by pressing back the cystocele into the vagina with their fingers.

Rectal symptoms are uncommon, although many women with prolapse are constipated. In rectocele patients may complain that they have difficulty in emptying the bowel.

It is exceptional for prolapse to be associated with menorrhagia, but slight hæmorrhages from trophic ulcers developing over large prolapses may be complained of.

Investigation and Diagnosis

It is important to examine all cases of prolapse with care, for the treatment to be adopted is based upon the physical signs found. First, the vulva should be examined for evidence of old lacerations of the perineum, and inspection will show whether the vaginal orifice is relaxed. The patient is then asked to strain down, and partly by inspection, partly by palpation, the nature of the prolapse, whether of the anterior vaginal wall, or of the uterus, or of the posterior vaginal wall, is determined. It is important to know exactly which structures prolapse, whether there is a urethrocele, of which degree the prolapse

of the uterus may be, whether there is a prolapse of the pouch of Douglas, and whether there is a rectocele. A rectocele can be accurately diagnosed only by rectal examination. The next step is to palpate the perineal body and the levator ani muscles to determine the muscle tone and the dimensions of the hiatus urogenitalis. Supra vaginal elongation of the cervix is to be suspected if the uterus is found to be abnormally long when palpated bimanually, but the most reliable method is to pass a sound and find the actual length of the uterine cavity. The position of the uterus is then determined by bimanual examination and the cervix inspected, when necessary, with a speculum.

2 On the whole, there is not much difficulty in arriving at an exact diagnosis if the patient is examined thoroughly and systematically. Difficulty may be experienced in distinguishing between a cyst of the anterior vaginal wall and a cystocele, but cysts of the anterior vaginal wall are usually tense with well-defined margins and cannot be reduced by pressure. Diverticula of the urethra are extremely rare, always small, and are situated low down in the anterior vaginal wall. Sometimes large tumours in the pouch of Douglas press down the posterior vaginal wall and cause a feeling of pressure and fullness in the pelvis, and unless the possibility of their presence is considered the practitioner may regard the case as one of prolapse. Myomatous polypi may present at the vulva, and unless the medical attendant examines the patient he may dismiss the case as one of prolapse.

Treatment of Cases of Prolapse

One of the most important problems that a medical man has to consider is the appropriate treatment to be advised in a case of prolapse arising in a young woman after childbirth. Some degree of relaxation of the vaginal orifice is a normal sequel to childbirth, and often there is some degree of prolapse of the vaginal walls combined with puerperal retroflexion of the uterus. Such patients are often fatigued by the strain of childbirth and lactation, and suffer from backache caused by muscle strain and weakness of the sacro iliac joints. It is a great mistake, however, to advise immediate operative treatment in such cases. If an operation is performed for the relaxed vaginal orifice, for the prolapsed vaginal walls, and for the retroflexed uterus, there is always the possibility of a recurrence after a succeeding pregnancy. The next point which must be borne

in mind is that such patients rapidly improve if well directed conservative measures are adopted. The patient should be told that she must obtain the necessary amount of sleep and she should be freed so far as possible from anxieties. Abdominal exercises, massage and exercise of the muscles of the perineum should be advised, and the patient should be encouraged to take every opportunity to get out into the open air. Retro flexion can be dealt with by replacement of the uterus and the introduction of a Hodge pessary. Most patients of this kind suffer from leucorrhœa, and an astringent alum douche should be advised. Riding is the best exercise possible for the perineal muscles, for the levator ani muscle contracts in association with contraction of the adductor muscles of the thighs. Clinical experience shows that patients of this type respond admirably to such conservative measures if the measures are adopted early and the exercises carried out strenuously. It should be regarded as an error of judgment ever to advise operative treatment for symptoms of this kind within six months of child birth. Prophylaxis is clearly of great importance, and fortunately it is the modern custom to insist upon puerperal women having exercises of this kind from within a few days of childbirth.

On the other hand, moderately severe cases of prolapse associated with the distressing symptoms of imperfect control of micturition are not uncommon in young women within a relatively short time of childbirth, when such conservative measures are ineffective. The question must be answered whether such women are to be treated by operation or whether they should be condemned to a pessary life. If an operation is performed there is always the possibility that a good operative result may be ruined by a subsequent childbirth. On the other hand, to be doomed to wear a pessary is an unpleasant prospect for any sensitive woman. With young women each case must be treated on its own merits. A well marked cystocele or a badly torn perineum are real indications for operative treatment, and it should be remembered that succeeding labours are less likely to be so difficult and complicated as the first confinement.

With women between the ages of fifty and sixty, and these comprise the majority of cases of prolapse, operations should be advised unless there is some general contra indication such as morbus cordis, chronic bronchitis, diabetes, and nephritis. Some women, however, prefer to wear a pessary rather than subject themselves to operative treatment.

In the case of old women pessary treatment is to be preferred to operation if the patient is frail. On the other hand



FIG 140 A ring pessary

prolapse in frail old women is apt to be of a severe degree, and quite often patients are unable to retain the usual forms of pessary. In such cases operations such as Le Fort's operation, which can be carried out simply with little risk to life, are of great service.

Pessary Treatment of Prolapse Ring pessaries are most frequently used in the treatment of prolapse. They are usually made from watch spring and covered with rubber. Others are ring shaped surrounded by rubber, but contain some fluid such as glycerine. The ring pessaries are first compressed in the hand, and introduced into the vagina in an antero-posterior sagittal plane, the perineum being pressed back to allow the pessary to pass into the vagina. The pessary is then rotated until it lies horizontally on the upper surfaces of the levator ani muscles. The diameter of the pessary is greater than the transverse diameter of the hiatus urogenitalis and consequently the pessary is retained in the vagina. The pessary stretches the walls of the vagina and takes up the slack vaginal tissues so that when the patient strains there is not only a feeling of support, but there is no slack vaginal tissue to protrude. Patients must be fitted with the correct size of pessary and much experience is required before the correct size can be judged. An accurately fitting pessary causes no discomfort and is an excellent method of treatment if the correct type of case is chosen. If the hiatus urogenitalis is widely patulous or if there is extensive prolapse not only of the vaginal walls but of the uterus itself then the pessary may not be retained. Pessaries should be changed every three months, and as they cause vaginal discharge the patient should be instructed to douche herself if possible every day and at least three times each week. If the uterus is retroflexed and can be replaced, a Hodge or Thomas's pessary is to be preferred to a ring pessary, for



FIG 141 Thomas's pessary

cradle pessaries of this type help to keep the uterus back in its normal position of ante flexion, in addition to stretching the vaginal walls.

In old patients with extensive prolapse, when a ring or cradle pessary cannot be retained, a Napier cup and stem pessary, preferably made of rubber, which is attached by tapes to a belt placed around the waist, is an extremely useful method of treatment. Air-ball pessaries are also of service in the treatment of prolapse in old patients who are unable to retain a ring pessary.

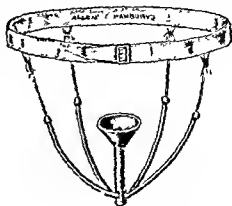


FIG. 142 A cup and stem pessary.

Other forms of pessary have been introduced in past years, but few have advantages over the types described above. If a pessary is retained for a long time, it produces extensive vaginal discharge, and may cause ulceration of the vaginal walls, and the development of carcinoma in ulcers of this type is not unknown.

The Operative Treatment of Prolapse. The type of operation to be advised in a case of prolapse depends upon the individual case. There is no fixed routine and the operation decided upon is selected according to which structures actually prolapse. The operation of perineorrhaphy is, however, almost always performed, the object of the operation being to reduce the dimensions of the hiatus



FIG. 143. An air-ball pessary.

urogenitalis.

For prolapse of the anterior vaginal wall some form of anterior colporrhaphy is to be preferred. It cannot be emphasised too strongly that perineorrhaphy and anterior colporrhaphy are not operations for prolapse of the uterus. In such cases surgical treatment consists either in Fothergill's operation, Mayo's operation, or ventri-fixation. For prolapse of the posterior vaginal wall perineorrhaphy is combined with a posterior colporrhaphy in the operation colpo-perineorrhaphy.

Prolapse of the pouch of Douglas should be treated by combined vaginal and abdominal measures, the hernial sac being removed from below and the utero sacral ligaments sutured together, and then the pouch of Douglas should be obliterated from the abdominal route by means of spiral sutures passed through the back of the uterus and the front of the sigmoid

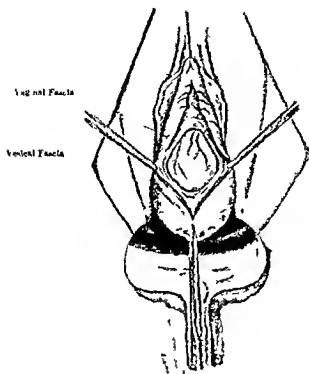


FIG. 144. Anterior colporrhaphy. A midline incision is made and the vaginal wall and vaginal fascia are cut through. The vesico vaginal space is opened up. The vesical fascia is recognised because of the dilated veins which ramify in its layer. (Leham Amreich.)

Pre-operative Treatment for Vaginal Operations The patient should be given antiseptic douches for about two days prior to the operation and each evening the vagina should be packed with gauze soaked in flavine solution, strength one in a thousand. The patient is given a purge about mid day on the day prior to operation and if necessary an enema the same evening. On the morning of the operation, an enema is given and the patient

should be catheterised about half an hour before the time fixed for the operation. On the evening before the operation the vulva should be shaved and the patient given a bath. The operation is performed with the patient lying in the lithotomy position under general anaesthesia.

ANTERIOR COLPORRHAPHY

The indication for this operation is when there is prolapse of the anterior vaginal wall. The bladder always comes down if

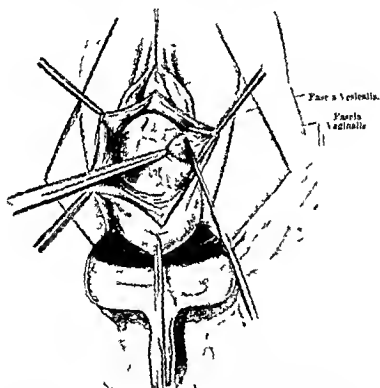


FIG. 143. Anterior colporrhaphy. The anterior vaginal wall has been divided in the midline and the vaginal fascia has been cut through to open the vesico-vaginal space. The vesical fascia is recognised because conspicuous veins ramify in it. The illustration shows how the two fascias have to be separated from each other laterally with a scalpel. (Peham Amreich.)

the anterior vaginal wall prolapses and if the lower third of the anterior vaginal wall prolapses, the urethra may prolapse as well. The principles of the operation are to excise an oval piece of the anterior vaginal wall, to mobilise the bladder and

push it upwards, and permanently to support the bladder by suturing together the fascial tissues which intervene between the vagina and bladder.

The posterior vaginal wall is retracted away by an assistant holding a Sims' speculum. In some cases a Jayle's speculum is of great help in obtaining a good exposure. The vaginal walls

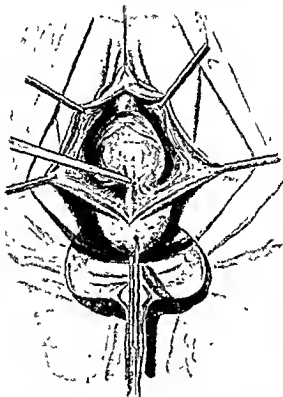


FIG. 140. Anterior colporrhaphy. After the bladder has been mobilised laterally the supravaginal septum which consists of the vesico-uterine ligament is held up with forceps, divided, and then the bladder is retracted upwards. (Peham-Amreich.)

and cervix are now disinfected with an antiseptic solution, such as tincture of iodine. The cervix is grasped with volsellum forceps and firmly brought down by an assistant. A longitudinal incision is made, extending from just below the urethral meatus to the point of junction of the vagina and cervix. Lateral incisions are now made from the cervical end of this incision. On each side an angular piece of tissue is enclosed by the

incisions and the flap is now dissected clear from the subjacent tissues. The line of cleavage is the vesico-vaginal space between the vaginal and vesical fascias. In this way the vaginal fascia is included in the lateral flap of tissue. The flap can be dissected away easily provided the correct layer is reached

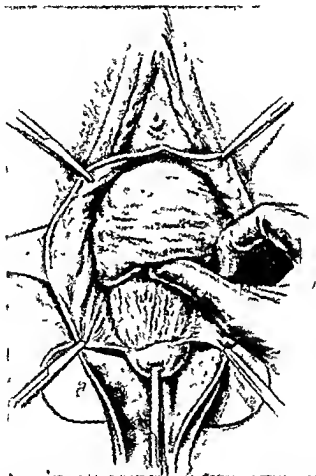
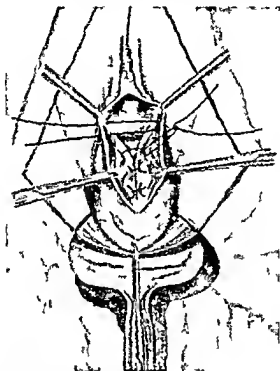


FIG. 147. Operation of anterior colporrhaphy. After the vesico-uterine ligament has been divided the bladder is pressed back. (Eden and Lockyer)

Unless this layer is found, the separation may be extremely difficult and if the dissection goes too deeply, there is a risk of injury to the bladder.

The next step is for the assistant to pull down the cervix firmly while the operator exposes the vesico-uterine ligament as in Fig. 146. The ligament fixes the bladder to the front of the

cervix The ligament is divided with scissors which mobilises the bladder so that the bladder can now easily be pushed back with gauze Again the separation of the bladder from the cervix is easy provided the correct layer is reached The lateral parts of the vesico uterine ligament are sometimes firmly adherent and there may be brisk hæmorrhage when the ligament



10148 Anterior colporrhaphy After the bladder has been pushed back the vaginal fascia is sutured together below the bladder and the lower stitches in the diagram pass through the substance of the cervix

is divided in this vicinity The lateral flaps of vaginal tissue are now excised and the amount of tissue removed depends upon the laxity of the vaginal wall and the degree of prolapse The next step is to prevent the bladder from prolapsing again A shelf of tissue to support the bladder is now formed as follows A suture is passed through the vaginal fascia which lies deep to the lateral margin of the cut vagina It is then passed through the front of the cervix and then through the

vaginal fascia of the cut edge of the vagina of the opposite side.

When this suture is tied the vaginal fascia becomes stitched to the front of the cervix at about the level of the utero-vesical pouch of peritoneum. Two or three sutures of the same kind are then introduced, and in this way a septum is formed which

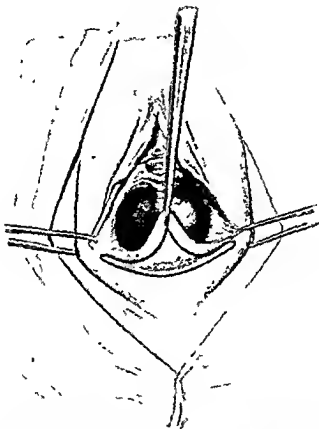


FIG. 149. Colpo perineorrhaphy. The lateral forceps are attached to the posterior part of the labia minora while the third pair of forceps is attached in the midline to the posterior vaginal wall (Peham-Amreich.)

prevents the bladder from protruding. Attention is now directed towards holding back the bladder anteriorly near the urethra. If the cystocele is extensive it is as well to put a purse-string suture through the vesical fascia and invert the bladder. The bladder is now held up by suturing the vaginal fascia together in a separate layer between the vagina and the vesical fascia. With a well-marked cystocele it may be necessary to

urethra and working down towards the cervix. It is most important that the plane of cleavage is the vesico-vaginal space. The cervix is now pulled down and the bladder mobilised as in the operation of anterior colporrhaphy as follows: The vesico-uterine ligament is divided and the bladder pushed back. In

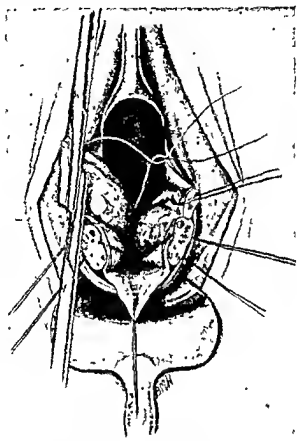


FIG. 155. Vaginal hysterectomy. The uterus has been removed and the pedicles are being ligatured.

this way, the anterior surface of the cervix is exposed. The cervix is now pulled to one side and the parametrium of Mackenrodt's ligament exposed. A clamp is placed on the ligament and the ligament divided near the cervix. The same procedure is carried out on the opposite side. The cervix is now mobilised and it is excised by cutting with a scalpel. The

cut cervix is drawn down with volsellum forceps. Haemorrhage from the cervix is controlled by hæmostatic sutures and care must always be taken to ensure complete hæmostasis. Any lateral vessels which bleed must be caught up with forceps and ligatured separately.

The next step is to shorten Mackenrodt's ligaments. This is performed by passing a suture through the lower part of the ligament lateral to the cervix, then passing the suture through the front of the uterus and then through Mackenrodt's ligament of the opposite side. When the suture is tied, the two ligaments are fixed together in front of the uterus and consequently shortened considerably.

The cut surface of the cervix is now covered with vaginal flaps as in the operation of amputation of the cervix described on p. 378.

The bladder is now dealt with just as in the operation of anterior colporrhaphy described on p. 408 by pushing it back and by suturing the vaginal fascia to the front of the uterus and below the bladder. The wound in the vagina is now closed by suturing the cut edges in the midline. A colpo perineorrhaphy is then performed in the usual way.

Mayo Palmer Operation. Although Fothergill's operation gives extremely good results in selected cases, it is insufficient for complete procidentia. The most suitable operation for this form of prolapse consists in a vaginal hysterectomy, after which the cut edges of Mackenrodt's and the utero-sacral ligaments, the broad ligaments, the round and ovarian ligaments, and the Fallopian tubes are sutured to the corresponding structures of the opposite side in the midline, to form a support for the bladder.

The following technique is employed. The cervix is pulled down with volsellum forceps and a midline incision made, extending from the urethral meatus anteriorly, to the cervix below. By means of lateral incisions, two triangular flaps are marked out and then dissected away just as in the operation of anterior colporrhaphy. The vesico uterine ligament is divided and the bladder retracted upwards and held back by an assistant with a Sims' retractor. The lateral incisions are now carried around the cervix just as in Fothergill's operation. This incision enables the uterus to be pulled down still farther.

The utero-vesical pouch of peritoneum is now identified as a convex fold of tissue and the pouch of peritoneum opened up

with scissors. The incision in the utero-vesical pouch is now extended laterally and the fundus of the uterus pulled through this opening either by hooking with a finger or with the help of volsellum forceps. In most cases, the uterus can be pulled down without difficulty.

The next step is to remove the uterus. Long straight clamps are used. The first clamp is placed immediately lateral to the

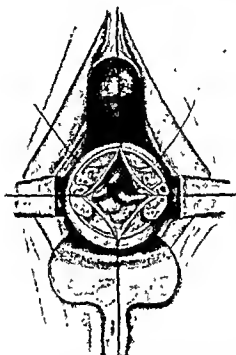


FIG. 136. Vaginal hysterectomy. The pedicles have been ligatured. The upper suture helps to hold back the bladder.

uterus and includes the ovarian ligament, the Fallopian tube and the round ligament of one side and these structures are cut through with scissors on the uterine side of the clamp. Further clamps are placed over the broad ligament and uterine artery of that side and the tissues again cut on the uterine side of the clamp. A similar procedure is then followed on the opposite side so that the uterus is now attached only by Mackenrodt's ligaments, the utero-sacral ligaments, and the posterior part of the vagina in the region of the pouch of Douglas. Each

of these structures is now clamped separately and the uterus removed. The pedicles are now ligatured with strong catgut and then sutured to the corresponding pedicle of the opposite side in the midline. The next step is to fix this shelf of tissue below the bladder. A series of sutures are therefore passed through the vaginal fascia of one side, through the tissues of the shelf, and then through the vaginal fascia of the other side. The peritoneal cavity is closed by including the peritoneum covering the bladder in the most anterior of these sutures, and the peritoneum covering the rectum in the most posterior of them. The cut edges of the vagina are now sutured together in the midline. Subsequently an extensive colpo perineorrhaphy is performed.

These are the main steps of the operation. One of the complications of the operation is that a hernia of the pouch of Douglas may develop at a later date. This complication is also seen after other operations for prolapse, such as ventrifixation and even Fothergill's operation. The great advantage of the Mayo Palmer technique is that steps can be taken during the operation to prevent this possibility (a) by removing the redundant peritoneum of Douglas' pouch, (b) by suturing together the utero-sacral ligaments, and (c) by suturing the levator ani muscles together with stitches which include the utero sacral ligaments.

Ventrifixation. Some gynæcological surgeons prefer to treat severe degrees of prolapse by performing anterior colpoorrhaphy and colpo perineorrhaphy, and then to open the abdomen by a midline incision and fix the uterus to the recti muscles by deep sutures through the front of the uterus. Other surgeons claim equally good results from Fothergill's operation without the necessity of opening the abdomen with its attendant mortality. Another disadvantage of ventrifixation is that if the prolapse is of a severe degree, a hernia of the pouch of Douglas may develop subsequently and be extremely difficult to treat surgically.

Le Fort's Operation. In this operation rectangular flaps are dissected away from the anterior and posterior vaginal walls and the raw surfaces sutured together so that the vagina is closed except for small channels on each side through which the normal uterine secretions can be discharged.

The operation is simple to perform provided that the flaps are marked out accurately. The operation is suitable for cases of *prolapsedia* in old women, and it gives good results.

After treatment of Vaginal Operations for Prolapse

The patient is nursed flat on her back and it is advisable for the knees to be tied together to control movements of the thighs, otherwise there is a risk of tension on the sutures in the perineum. Most patients have a great deal of pain from the perineal sutures.

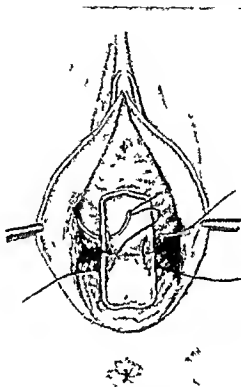


FIG. 157. Le Fort's operation. Rectangular pieces of vaginal wall have been excised from the anterior and posterior vaginal walls. The edges of the raw surfaces so produced are sutured together. In this way the vagina is almost completely closed.

and opiates should be given freely during the first three days after the operation. The bowels should be confined for at least three days after the operation. During the third day the patient should be given paraffin by mouth followed by a purge on the night of the third day, and an olive oil enema on the same

degree It should be treated in the usual way by the administration of large quantities of citrates and bland fluids Sometimes a pyelitis develops, but it usually subsides quickly under the same treatment Urinary fistulas due to injury either to the ureters or bladder represent the results of bad technique

Hæmorrhage Reactionary hæmorrhage is not uncommon after plastic operations on the vagina Such operations are often accompanied by fairly profuse hæmorrhage, with the result that the patient's blood pressure falls towards the end of the operation During recovery from the anæsthetic, when the blood pressure rises, vessels which have not been tied are apt to bleed fairly profusely It is most important to plug the vagina tightly with dry sterile gauze immediately after the operation for this serves to control reactionary hæmorrhage of this kind If reactionary hæmorrhage develops there is only one course to pursue The patient must be anæsthetised, clots removed from the vagina, and the vagina irrigated with a hot douche No attempt should be made to open the wound and clamp bleeding points, but the vagina should be plugged tightly with dry sterile gauze The gauze can be removed almost painlessly without anæsthesia twenty four hours later

Secondary hæmorrhage following upon plastic vaginal operations is less frequent than reactionary hæmorrhage and is caused by sepsis The principles of treatment are the same as those recommended for reactionary hæmorrhage, the patient being anæsthetised the vagina irrigated clear of blood, and packed tightly with dry sterile gauze Sometimes hæmorrhage following upon plastic vaginal operations is of an extremely severe degree and the patient has to be treated by blood transfusion Moreover, with secondary hæmorrhage it may be necessary to replug the vagina, for recurrent hæmorrhage is very likely to occur

Suppuration in the Wound Although the wounds in the vagina heal remarkably well if good apposition is obtained there is a tendency for the vaginal and perineal wounds to break down and suppurate Fortunately, the sepsis is usually superficial and gives rise only to a purulent offensive vaginal discharge which responds readily to vaginal irrigation with antiseptic solutions Acute fatal pelvic cellulitis is not unknown, but is extremely rare If the perineal wound breaks down and suppurates, it should be treated with copious irrigations and the patient should be given frequent hot baths during the 2nd week after operation

Thrombosis The development of white leg and thrombophlebitis of the veins of the legs and pelvis is a fairly common complication of plastic operations on the vagina. The condition mostly arises in anæmic women who are advanced in years and of the asthenic type. Fatal pulmonary embolism is another complication which occurs from time to time. Such complications should always be remembered during the after treatment. The patient should be encouraged to move about in bed and to take deep inspirations.

CHAPTER XIX

DISPLACEMENTS

THE normal position of the uterus is one of anteversion and anteflexion. The body of the uterus is normally flexed forwards on the cervix in the situation of the internal os. If the uterus

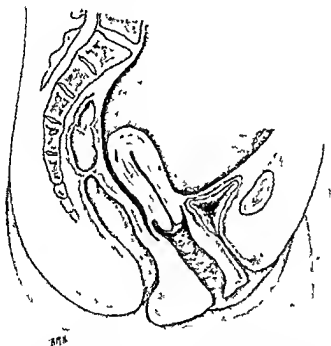


FIG 158 A retroverted uterus. The long axis of the uterus lies along that of the vagina. The external os lies in the middle of the long axis of the vagina. In this case the uterus is neither anteflexed or retroflexed

lies anteverted and anteflexed, the external os is found, on vaginal examination, to be pointing downwards and backwards, and the anterior lip of the cervix is the first part of the uterus to be felt. The uterus may, however, lie so that the axis of the cervix is rotated backwards through an angle of 90 degrees, so

that the external os points downwards and forwards, and the posterior lip of the cervix is the first part of the cervix to be felt on vaginal examination. In such cases the cervical canal, when traced upwards, is directed upwards and backwards, and the uterus is described as being retroverted. In most cases of retroversion the uterus is also retroflexed, so that the body of the uterus is flexed backwards on the cervix. Version, therefore, refers to the direction of the cervical canal, whereas flexion refers to the inclination of the body of the uterus on the cervix. If the uterus is retroverted but anteфлекed, it is customary to describe the uterus as lying far back in the pelvis, rather than to introduce the pedantic nomenclature of the "retroverted anteфлекed uterus."

It is difficult to explain why the normal uterus is anteфлекed, for it seems unlikely that the round ligaments of themselves maintain the position of anteфлекion. Probably the muscle tonus of the uterus itself controls the flexion of the body of the uterus on the cervix. In visceroptosis and asthenic conditions, the body of the uterus can be moved almost freely on the cervix and the myometrium of the uterus is obviously lax and slack, whereas in normal cases, with the uterus anteфлекed, it may be almost impossible to make the uterus retroflexed, even after the uterus has been removed.

The significance of retroflexion and retroversion, whether these displacements are responsible for symptoms and whether treatment should be recommended to correct such displacements, offers one of the most difficult problems in the whole of gynæcology. Probably all gynæcologists will admit that the uterus may be retroflexed and retroverted without attendant symptoms, while they will also admit that some patients with retroflexion and retroversion who have such symptoms as back ache and dyspareunia, can be cured completely of these symptoms if the displacement of the uterus is corrected. The problem, therefore, is essentially to determine which type of case causes symptoms. Clearly such cases require treatment. From the clinical point of view it is best to group the cases into those in which the uterus is movable and replaceable and those in which the uterus is fixed in its retroflexed position.

Mobile Retroflexion

(a) The uterus is often congenitally retroflexed, and it is not uncommon to find the uterus in the retroflexed position without

the patient complaining of gynecological symptoms. It may be that the patient is examined pelvically because of leucorrhœa or dysmenorrhœa, but if the uterus is found to be retroflexed it does not follow that such symptoms are caused by the retroflexion. A uterus which is congenitally retroflexed is often ill developed, and such symptoms as dysmenorrhœa and

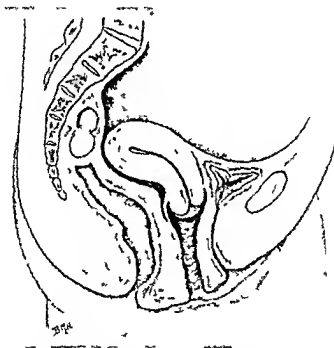


FIG. 150. A uterus which is both retroflexed and retroverted. The body of the uterus is bent backwards on the cervix.

sterility may be determined rather by the ill development than by the retroflexion.

(b) In visceroptosis and asthenia the uterus is almost always found to be retroflexed. In such cases the displacement should be regarded as being determined by an intrinsic fault in the myometrium. Most patients of this kind have no gynecological symptoms, but some of them suffer from backache. It does not necessarily follow, however, that the backache is caused by the retroflexion; it may be due to weakness of the sacro-iliac joints or it may be a true muscle backache due to atony of the muscles of the back.

(c) Similarly, a large number of cases of retroflexion are seen in women after child birth and can be regarded as comparable to those of the previous group. It has been pointed out already, on p. 401, that such displacements often right themselves spontaneously when the patient's muscle tone is improved by massage and exercises.

(d) In other cases the displacement of the uterus is caused by the presence of tumours such as myomata and ovarian cysts in the pelvis, which push the uterus backwards and by their presence make the uterus retroflexed.

The question which must now be answered is whether a mobile retroflexion of the uterus of this type is responsible for gynaecological symptoms. Sterility may be due to ill development or it may possibly be due to acute retroflexion of the uterus hindering the migration of spermatozoa past the internal os. Dyspareunia may be caused by the ovaries being prolapsed behind the uterus into the pouch of Douglas. Dysmenorrhœa is almost certainly caused by ill development of the uterus rather than by displacement. A satisfactory explanation cannot be offered as to why leucorrhœa should be induced by retroflexion of the uterus.

The difficult cases are those in which the mobile retroflexed uterus is associated with backache. If the uterus is retroflexed and the ovaries are prolapsed into the pouch of Douglas it is conceivable that the ovaries may be pressed upon if the sigmoid is distended, and in this way backache can be explained. Clinical experience shows that a mobile retroflexion of itself is not necessarily the cause of backache, for if the uterus is fixed by operation to the anterior abdominal wall the backache may remain.

If the retroflexion is mobile, and the patient free of symptoms, no treatment is necessary. If, on the other hand, the patient complains of sterility, dyspareunia or backache, and the uterus is found retroflexed, the uterus should be replaced and kept in position with a Hodge pessary. If the symptoms persist after the uterus has been replaced by this relatively simple method, operative treatment for the retroflexion is clearly unjustifiable, for the symptoms must necessarily be due to some other cause.

The Technique of Replacement of the Retroflexed Uterus It is possible to replace a mobile retroflexion bimanually, although much experience and skill are necessary. The patient should

In difficult cases it may be necessary to attach volsellum forceps to the anterior lip of the cervix before the uterus can be

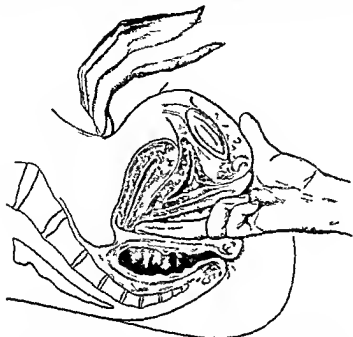


FIG. 163 Retroflexion of the uterus. The technique of manual reposition. Stage IV. (Jellett and Tottenham)

replaced. A Sims speculum is introduced into the vagina and a pair of volsellum forceps attached to the anterior lip of the cervix. Traction is now applied to the volsellum forceps with the left hand and two fingers of the right hand are placed in the posterior fornix to push up the retroflexed body of the uterus. After a time the fingers of the right hand are withdrawn from the vagina and traction is made by means of the right hand on the volsellum forceps, the left hand being placed on the abdomen and an effort made to place the fingers of the left hand behind the uterus. The cervix should now be drawn downwards and pushed backwards, and in this



FIG. 164 A Hodge pessary

way the fingers of the left hand may be insinuated behind the body of the uterus. With the volsellum method the technique should be performed very slowly and continuous traction made.



Fig. 155. Method of fitting a Hodge pessary. (Liden and Lockyer.)

Other methods of replacement of the uterus have been recommended. A method which is reputed to be invaluable is to place the patient on an operating table in Trendelenberg's position

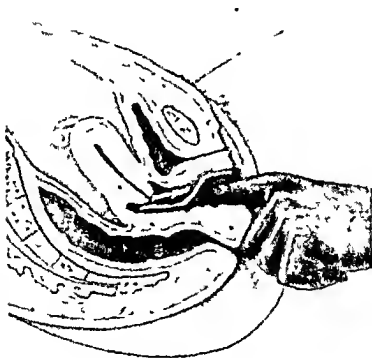


Fig. 156. The introduction of a Hodge pessary. (Liden and Lockyer.)

and to introduce a hydrostatic bag containing mercury into the vagina

Pessary Treatment After the uterus has been replaced a pessary should be introduced into the vagina to maintain the uterus in its anteflexed position. The pessary should be made of vulcanite and be either of the Hodge or Thomas type. In the Thomas pessary the broad end lies in the posterior fornix, and the lower end lies in contact with the anterior vaginal wall, the cervix passing through the middle of the pessary. In Hodge's pessary the upper and lower ends are approximately of the same diameter. There is little to choose between the two pessaries, for the curvatures are approximately the same. Both pessaries lie above the level of the levator ani muscles. Pessaries of this kind are almost useless in the treatment of retroflexion unless the uterus has first been anteflexed. They are intended to maintain anteflexion and prevent retroflexion, and not of themselves to cure retroflexion. If a patient is using a cradle pessary of this type, she should douche herself as already described (p. 192).

Fixed Retroflexion

Cases of fixed retroflexion are much more important clinically than those in which the uterus is mobile. Most cases of fixed retroflexion result from salpingo-oöphoritis and pelvic peritonitis. In salpingo oöphoritis the heavy, oedematous, distended Fallopian tubes prolapse behind the uterus, and, partly by their weight and partly through forming adhesions to the posterior surface of the pouch of Douglas, pull back the uterus and cause retroflexion. In the process of healing, adhesions form which bind the uterus firmly in its retroflexed position. Moreover, the ovaries are prolapsed behind the uterus and from the previous inflammation become tender and cause backache and dyspareunia. In other cases, fixed retroflexion is caused by chocolate cysts of the ovary and pelvic endometriosis, which, again, fix the uterus by adhesions in a retroflexed position. Other causes of fixed retroflexion, such as abdominal tuberculosis, are uncommon. It must be understood, however, that fixed retroflexion is a relative term. Mobile retroflexion may seem to be fixed to a practitioner who is not skilled in gynaecological examinations.

Patients with fixed retroflexion almost invariably have

gynæcological symptoms. ¹ Dyspareunia is caused partly by the tender prolapsed ovaries and partly by adhesions in Douglas's pouch. ² Sterility is caused by adhesions around the Fallopian tubes. ³ Backache can be explained by the tender ovaries, by chocolate cysts and by pelvic endometriosis.

If, however, a patient with such symptoms as sterility, dyspareunia, and backache is found to have a fixed retroflexion,

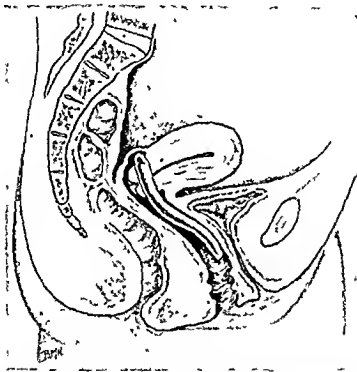


FIG 167 A Hodge pessary *in situ*. The upper end lies in the posterior fornix while the lower part of the pessary is in contact with the anterior vaginal wall. Any tendency to retroflexion or retroversion is resisted by the upper end of the pessary.

and if induration or enlarged appendages are found in Douglas's pouch the symptoms can reasonably be attributed to one of the causes named above. Moreover, it is clear that attempts at replacement are almost certain to fail, and in such cases operative treatment is justifiable although something more than fixation of the uterus in an anteflexed position may be necessary to cure the abnormalities of the appendages.

Indications for Operation in Cases of Retroflexion

If the retroflexion is mobile, the uterus should be replaced manually, if necessary under anesthesia, and a Hodge pessary should be introduced to retain the uterus in its ante flexed position. If the patient is rendered free of symptoms operative treatment is unnecessary, unless the patient objects to wearing the pessary. Cases are seen from time to time, however, when the ovaries prolapse into Douglas's pouch to cause dyspareunia, in spite of the uterus being replaced in its normal position. In such cases some form of ventrisuspension operation may be necessary.

In other cases, pessary treatment may be unable to control retroflexion, so that even if the uterus has been ante flexed it tends to become retroflexed, although a pessary has been introduced into the vagina. If patients of this kind have symptoms such as dyspareunia, repeated abortions or sterility, it is justifiable to operate and fix the uterus in an ante flexed position. Similarly, in all cases of fixed retroflexion, if the patient has symptoms, operative treatment is clearly indicated.

It is very doubtful if operative treatment for retroflexion is justifiable unless it can be conclusively established that the patient has symptoms definitely attributable to the retroflexion. By adopting the methods recommended above, the practitioner should first convince himself that this is the case before advising operation. Many women refuse to wear a pessary and insist upon operation. On the other hand many women are operated upon and the displacement of the uterus is corrected, and not only do they continue with the symptoms which they originally possessed which were in no way connected with the retroflexion, but they acquire further symptoms, particularly low abdominal pain which can definitely be attributed to the operation itself. Unjustifiable surgical intervention is not perhaps better illustrated than by some operations performed for retroflexion of the uterus.

Operations for Retroflexion

Alexander Adams Operation In this operation the inguinal canals are opened, the round ligaments exposed, pulled down and shortened by plication. As a result, the uterus is forcibly pulled forward into the ante flexed position by the shortened round ligaments. The operation is simple to perform without the risks attendant on opening the peritoneal cavity, and gives

good results. The objection to the operation is that no opportunity is afforded of inspecting the uterus and appendages. Moreover, intraperitoneal adhesions cannot be divided. The operation is therefore suitable for mobile retroflexion when no other complication is suspected.

Ventrisuspension. In the operations of ventrisuspension, the two round ligaments are sutured together in front of the rectus muscle so that the round ligaments are not only shortened, but attach the uterus directly to the anterior abdominal wall. The peritoneal cavity is first opened by a midline or Pfannenstiel incision and any adhesions or abnormality of the appendages first dealt with. In the Doleris, or Gillian operation a suture is passed round one round ligament at a distance of an inch and a half from the uterus and the suture drawn through a hole made through the rectus muscle and the anterior parietal peritoneum, so that a loop of round ligament now lies in front of the rectus abdominis muscle. The same procedure is carried out on the opposite side. Care must be taken to ensure that the hole in the peritoneum is small, otherwise small intestine may become adherent or actually herniate through the opening and cause intestinal obstruction. Before closing the peritoneum, the operator should draw down the omentum behind the uterus, otherwise there is a risk of adhesions forming between the small intestine and the wound in the parietal peritoneum. The peritoneal cavity is now closed and then the round ligaments are sutured together in front of the rectus muscle. The wound is closed in the usual manner.

In another method of ventrisuspension the round ligaments are drawn up to the rectus muscles extraperitoneally by passing a long curved pair of forceps beneath the anterior parietal peritoneum, starting from the abdominal incision, and passing to the internal abdominal ring and then along the round ligament to a point about an inch and a half from the uterus. The forceps are now pushed through the peritoneum into the peritoneal cavity and grasp the ends of the suture placed around the round ligament. The forceps are now withdrawn and bring the round ligament with them. In this way the two round ligaments are sutured together in front of the rectus muscle. This technique is less likely to be followed by the formation of adhesions than in the original Doleris operation.

All sorts of modifications of the operation of ventrisuspension are in use. In Baldy's operation the peritoneal cavity is opened

and the round ligaments are drawn through openings made in the broad ligaments and sutured together *behind* the uterus and also to the posterior surface of the uterus itself (Fig 168)

Much ingenuity can be expended in devising different

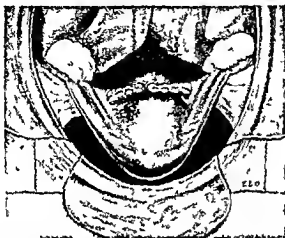


FIG 168 The Baldy operation for retroflexion. The round ligaments have been drawn through the broad ligaments and sutured to the back of the uterus (After Halban)

techniques for the operation of ventrisuspension, and almost every gynaecologist has his own particular method. The great advantage of promoting antelexion by shortening the round ligaments is that enlargement of the uterus in a subsequent pregnancy is not interfered with, and obstetrical complications are relatively few. On the other hand, unless the operation is done carefully, the retroflexion may recur at a later date.

In the operation of ventrifixation, the body of the uterus is sutured directly to the rectus muscle. Ventrifixation is most suitable in patients who have passed the child bearing period of life, for there is some evidence that both pregnancy and subsequent labour may be complicated if the operation has been performed previously.

Retroflexion of the Gravid Uterus

Although retroflexion of the uterus offers some hindrance and probably in some cases acts as an actual bar to conception, it is not uncommon for a woman to conceive although the uterus

is in the retroflexed position. Most commonly the retroflexion is puerperal, although a woman with a congenitally retroflexed uterus may sometimes conceive. If the retroflexion is congenital and associated with an ill developed uterus, there is a well-marked tendency to miscarriage during the third month. In other cases, if the uterus does not right itself spontaneously, the pressure exerted on the uterus may be sufficient to dislodge the ovum and lead to abortion. Fortunately, in the majority of cases of retroflexed gravid uterus, as the uterus enlarges it rights itself spontaneously, and, apart from minor symptoms of backache and frequency of micturition, no abnormal symptoms may be complained of. Very rarely, the uterus becomes impacted in the pelvis, and then pressure symptoms arise which lead to the patient developing retention of urine.

Retention of urine is the most important and characteristic symptom of an incarcerated retroflexed gravid uterus. The retroflexed gravid uterus tends to sink, so that the fundus of the uterus is at a very low level in Douglas's pouch. As a result, the anterior vaginal wall and the urethra are stretched and the muscles at the base of the bladder pass into spasm. The retention is not caused by direct pressure on the urethra, for a rubber catheter can always be passed without difficulty. The bladder fills with urine and forms a large abdominal tumour which is tense and tender, and projects anteriorly more than the normal gravid uterus. Patients may develop retention overflow, and have dribbling and frequent micturition. Unless treatment is adopted, cystitis develops, while in severe and protracted cases the mucous membrane of the bladder may slough and be discharged from the urethra, and as a result of sepsis may lead to fatal septicæmia. Retention of urine due to a retroflexed gravid uterus usually develops between the 12th and 14th weeks of pregnancy.

The main symptom is retention of urine, and the possibility of a retroflexed gravid uterus should always be borne in mind if this symptom is complained of at the end of the third month of pregnancy. Care must be taken in arriving at the diagnosis. A ruptured ectopic gestation with a pelvic hæmatocele sometimes causes retention of urine, and in any case may cause difficulty in diagnosis, for the physical signs are in many ways similar. In pelvic hæmatocele the cervix is pushed forwards, but the external os looks downwards, whereas with a retroflexed gravid uterus the external os looks forwards, and, very charac

teristically, the anterior vaginal wall is stretched. Moreover, a pelvic hæmatocele has an indefinite outline, and is often extremely tender. If an accurate bimanual examination is possible the body of the uterus can be palpated separate from the swelling in Douglas's pouch. In both types of case a history of slight vaginal hæmorrhage may be obtained and in both conditions the patient suffers from abdominal pain.

Retention of urine may be caused during pregnancy by a myoma or an ovarian tumour impacted in the pelvis. Difficulty may be experienced in distinguishing such a condition from retroflexion of the gravid uterus, complicated by full bladder. The retroflexed gravid uterus is soft and smooth, whereas a myoma is hard and an ovarian cyst is tense and cystic. Moreover, if the abdominal swelling is the pregnant uterus, the cervix, although pushed forwards, is directed downwards instead of forwards, as in the case of the retroflexed gravid uterus. Again, the full bladder is tense, tender and fixed, and lies more anteriorly than the gravid uterus. It is important to establish the diagnosis for if attempts are made to replace the swelling in the pouch of Douglas, if the swelling happens to be a pelvic hæmatocele, the patient may collapse and die from intra abdominal bleeding. The diagnosis can be made with absolute precision by emptying the bladder with a catheter.

The Treatment of Retroflexed Gravid Uterus with Retention of Urine. The patient should be placed in the left lateral position and a self retaining catheter introduced with all aseptic precautions into the bladder. Sometimes the urethral meatus is drawn up into the vagina and may be found only with difficulty, but this is unusual. After the self retaining catheter has been introduced the patient is turned on her back and the catheter connected by means of a long piece of rubber tubing which is passed to a receptacle under the bed. The essential part of the treatment is to empty the bladder slowly. This should be done by attaching a screw clip to the rubber tube, and allowing the urine to run away very slowly, so that at least thirty six hours is taken to empty the bladder. If this method is adopted, at the end of thirty six hours the uterus will be found to be lying in an ante flexed position, having righted itself spontaneously. This method of treatment has never been known to fail in the author's experience, although cases are described in which the uterus has been held down by adhesions so that some form of manual reposition or even an abdominal operation

has been necessary. If the bladder is rapidly emptied by catheterisation there is not only danger of hæmorrhage into the bladder, but the uterus remains retroflexed and retention will recur.

Acute Antelexion of the Uterus

The uterus is sometimes congenitally acutely antelexed, so that the body is bent forwards at an acute angle on the cervix. These cases have been described in Chapter XV in the section dealing with Dysmenorrhœa. The acutely antelexed uterus, or cochleate uterus, is usually associated with the symptoms dysmenorrhœa and sterility.

Lateral Displacements of the Uterus

The uterus is sometimes displaced congenitally to a position a little to the left of the midline. At other times the uterus is pulled to one side by peritoneal adhesions resulting from salpingo-oöphoritis and by scars resulting from past parametritis. Alternatively the uterus may be pushed over to one side by swellings of the Fallopian tube such as pyosalpinx, hydrosalpinx, and hæmatosalpinx, by tumours of the ovary and by broad ligament swellings such as myomata and fimbrial cysts. Intraperitoneal swellings such as appendix abscess, carcinoma of the sigmoid, and diverticulitis abscess may also push the uterus over to the opposite side. Lastly, a large acute parametric effusion may push the uterus over to one side.

Other Displacements

Sometimes the cervix is found to be higher up than normal when a vaginal examination is made. The best examples are afforded by the cases in which large swellings, such as myomata and ovarian cysts, are found in Douglas's pouch, which push the uterus upwards and forwards. The cervix is also higher up than normal when a myomatous polypus is being extruded and in cases of inversion of the uterus. Similarly, if the uterus is retroflexed, and particularly if the uterus is also pregnant, the cervix is higher than normal and displaced forwards.

If, on the other hand, the cervix is found to be lower than normal when a vaginal examination is made, either prolapse

the patient. When the tumour which protrudes through the cervix is pulled down with volsellum forceps, if the cervix moves upwards, then it is certain that an inverted uterus is present. If the tumour is a polypus, traction brings down the cervix or the tumour may be pulled further through the external os without the cervix being drawn up.

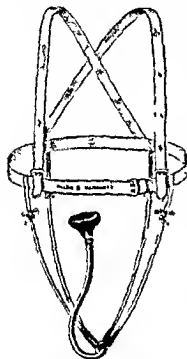


FIG 171 Aveling's repositior

It is important to be quite certain of the diagnosis, for it is customary for myomatous polypi to be shelled out from below. If this procedure is adopted with an inverted uterus the peritoneal cavity will be opened with the risk of spreading peritonitis.

Treatment With chronic puerperal inversion, reposition should be attempted with an Aveling repositior, which consists of a vulcanite cup attached to a curved metal rod. The vulcanite cup is placed in contact with the inverted fundus and pushed upwards. The rod is kept in this position by means of tapes attached to a waistband, the tension applied being regulated by the tension on the tapes. The treatment causes very severe shock and pain, but it is usually successful. Ingenious abdominal operations have been devised for correcting chronic inversion of this kind, but they are hardly ever necessary. Inversion caused by fundal myomata should be treated by hysterectomy, the vaginal route being the method of choice.

CHAPTER XX

NEW GROWTHS OF THE UTERUS

CONNECTIVE TISSUE TUMOURS

Myomata

MYOMATA are innocent new growths which usually arise in the myometrium. They are extremely common and comprise 10 per cent. of all gynaecological cases. It has been computed that about 15 per cent. of all women after the age of thirty-five have myomata.

The tumours were known to Hippocrates, who called them *scleromata*. They were described as fibrous tumours of the uterus during the early part of the last century. Rokutansky called the tumours *fibroids*, but it was Virchow who demonstrated that they were essentially *leio-myomata*. Although the terms "*fibroids*" and "*fibro-myomata*" are in common use, the correct terminology is "*myomata*."

The tumours are spherical in shape and encapsulated so that they can be shelled out fairly easily. They are usually multiple and may attain an enormous size. John Hunter described a myoma which weighed 140 lbs.

Incidence. The tumours are most common between the ages of 40 and 50, 50 per cent. of cases being found in patients of this decade of life. Thirty per cent. are found in patients between the ages of 30 and 40. The tumours are very rare indeed before the age of 20, but they are found not infrequently in women of post-menopausal age. In patients between the ages of 40 and 50 the distribution is as follows. Virgins 10 per cent., nulliparæ 30 per cent., uniparæ 20 per cent., and multiparæ 40 per cent. These statistics do not account for the relative preponderance of married women over the age of 40, and are in some ways misleading. A woman who has borne a large family is far less likely to develop myomata than a woman who has never been pregnant at all. The statistics show that 60 per cent. of myomata arise in women who have either never been pregnant or have had only one child.

Anatomy. A typical myoma is a spherical tumour whose cut surface has a whorled appearance. Small tumours are firmer in consistence than the myometrium, while larger myomata are hard and firm owing to hyaline degeneration. The capsule consists of connective tissue which fixes the tumour to the myometrium. Although not easily visible to the naked eye the



FIG. 174.—An intramural myoma.

capsule is clearly defined if the myoma is shelled out. The vessels which supply the tumour lie in the capsule and send radial branches into the middle of the tumour. The blood supply of the middle part of the tumour is far less than of the periphery, so that degeneration is best marked in the middle. On the other hand, in calcareous tumours, lime salts which are deposited from the blood stream are most plentifully deposited near the periphery, and quite often the radial direction of the vessels can be distinguished when a calcareous myoma is examined. If

the myoma has attained any great size large vessels are found in the capsule. These vessels are best distinguished in subserous tumours, while with large intramural myomata they can be seen beneath the peritoneal covering of the uterus and serve to distinguish the enlargement of the uterus from a normal intra uterine pregnancy.

All uterine myomata arise



FIG 175 Myomata of the uterus. There is a large subperitoneal myoma attached to the fundus. The specimen was removed three months after delivery. There is an intramural myoma in the fundus. The pale peripheral rim is caused by fatty change and calcareous degeneration. The small dark area in this myoma is due to red degeneration.



FIG 176 Submucous myoma of the uterus.

in the myometrium. The tumour may grow symmetrically, remaining in the myometrium, when it is termed "intramural". At other times, the tumour is extruded towards the surface of the uterus so that it

may project into the peritoneal cavity and, in extreme cases, be attached only by a small pedicle to the uterus. This type of myoma is referred to as "subserous," or "subperitoneal". In other cases the myoma is extruded into the broad ligament, forming a broad ligament myoma. The contractions of the uterus may, however, force the myoma towards the cavity,

Size. All gradations in size are known between mammoth tumours and minute seedling myomata which can be detected only with precision by microscopical examination.

Shape. Small tumours are spherical, because the development is centrifugal, with the resistance to growth uniformly distributed around the tumour. Large tumours are distorted because they project either into the cavity of the uterus or into the peritoneal cavity, so that the resistance to their growth is distributed irregularly. Large pelvic tumours may be distorted from pressure if they lie in the pelvis.

Secondary Changes

Degenerations. Hyaline Degeneration. Some degree of hyaline degeneration is present in all tumours more than 1½ in. in diameter. A hyaline myoma is hard and firm, and the striated



FIG 186. Myoma of the uterus showing early hyaline degeneration. The muscle bundles stain deeply, while the paler tissues represent muscle and connective tissue undergoing hyaline change.

appearance of the cut surface is inconspicuous. An extreme degree of hyaline degeneration causes the whorled appearance to be lost, so that the tumour has a uniform waxy appearance, but such cases are very unusual. Hyaline degeneration is best identified microscopically. The outlines of the muscle cells become indefinite and the cell protoplasm merges with a structureless intercellular matrix. The nuclei remain for a time, but eventually break up to become disorganised into the structure-

less hyaline material. Hyaline degeneration is best marked in large subserous tumours. It causes no specific clinical symptoms and is only of pathological interest.

Cystic Degeneration. Cystic degeneration represents a late stage of hyaline degeneration when the hyaline material undergoes liquefaction. The tumour becomes soft, and irregular spaces filled with clear fluid are found in the middle of the tumour. Cystic degeneration is met with most frequently with large intramural tumours, and is best marked in the middle, probably because the blood supply is less plentiful here than at the periphery.

Cystic degeneration must be distinguished from lymphangiectasis, in which large fluid spaces filled with lymph and lined by endothelium are found in the substance of the tumour.

Calcareous Degeneration. In calcareous degeneration, phosphates and carbonates of lime are deposited in the periphery along the course of the vessels. The best examples of calcareous myomata are those in old patients with long-standing myomata. They are found as "womb-stones" in old grave-yards. Calcareous degeneration is not uncommon as a sequel to the red degeneration which develops in myomata particularly during pregnancy. Such tumours subsequently become fatty and the fatty acids are changed first into soap and albumins, and finally, by the interaction of the carbonates and phosphates of the blood, into calcium phosphate and carbonate. Very rarely true ossification ensues upon calci-



FIG. 181 Calcareous degenerate myoma after incision. The specimen has been divided into two parts.

fication. Calcareous tumours are easily identifiable in X rays photographs of the pelvis of such cases.

Fatty Changes. Fatty degeneration of the muscle cells of myomata is relatively uncommon and most cases result from previous red degeneration. In other cases true fat cells are found amongst the muscle cells of myomata but these cases are very rare.



FIG. 18.—Sarcomatous change in a uterine myoma. The dark irregular areas in the substance of the myoma which lie in the middle of the specimen represent areas of sarcomatous change.

Red Degeneration

This complication of uterine myomata develops most frequently during pregnancy, although it is not rare in cases of painful myomata in women over the age of 40. The myoma becomes tense and tender and causes severe abdominal pain. The tumour itself assumes a peculiar purple red colour and develops a fishy odour. If the tumour is carefully examined, some of the large veins of the capsule and the small vessels in the substance of the tumour will be found to be thrombosed. The discoloration is caused by diffusion of blood pigments from the thrombosed vessels. Histologically, apart from

thrombosis, no specific appearances have been identified, although it must be remembered that previous hyaline degeneration may be present. There is good evidence that the lipid content of the red degenerate myoma is increased, and it has been suggested that a lipid toxin is responsible for the thrombosis. Little is known of the exact aetiology and particularly of why only the myoma should be involved and not

the myometrium. The pathological changes are not unlike those encountered in cases of concealed accidental hæmorrhage.

Sarcomatous Degeneration. The development of a sarcoma in the tissues of a pre-existing myoma is relatively infrequent. A sarcoma of the uterus may arise primarily in the myometrium or endometrium and infiltrate a myoma. Care must therefore be taken to establish that sarcomatous changes found in a myoma are not caused by the myoma being infiltrated by a sarcoma arising in some other part of the uterus. The statistics of the incidence of sarcomatous changes in myomata differ widely because the recognition of malignancy by histological means in the case of a connective tissue tumour such as a myoma requires great experience. Moreover, small areas of embryonic tissue are frequently found in most myomata and this tissue may very easily be mistaken for sarcoma. Probably in 15 per cent. of all cases of myomata malignant change can be demonstrated in the myoma. Intramural tumours are most frequently involved, after them cervical myomata, and, least frequently, subserous tumours. It is rare for malignant change to develop in a myoma under the age of 40, and 50 per cent. of cases arise between the ages of 40 and 50. The tumour is usually a leiomyosarcoma but spindle celled, round celled and mixed celled tumours may be found. The tumour may erode through the capsule of the primary myoma and produce polypoidal projections into the cavity of the uterus. In most cases the diagnosis is made only after the removal of the uterus, but rapid enlargement of the myoma associated with profuse hæmorrhage and wasting might cause the possibility to be suspected. Similarly, in post-menopausal women, rapid enlargement of the myoma is almost pathognomonic of sarcomatous change. To the naked eye a sarcomatous myoma is yellowish grey in colour and often infiltrated with blood. The consistence is friable and soft, quite different from the typical firm consistence of a simple myoma.

Other Complications of Myomata

Torsion. A subserous myoma may undergo rotation at the site of its attachment to the uterus. As a result, the veins are occluded and the tumour becomes engorged with blood. Very severe abdominal pain is experienced and most patients are operated upon immediately. Very rarely the rotated tumour may adhere to adjacent viscera, obtain a fresh blood supply

from these adhesions and finally be detached completely from the uterus. Axial torsion of a subserous myoma is a very rare phenomenon.

Axial rotation of the whole myomatous uterus itself is seen from time to time. In such cases a large subserous myoma is attached near the fundus the uterus itself being only slightly enlarged and the site of rotation is in the neighbourhood of the internal os at about the level of Mackenrodt's ligament. The symptoms are comparable to those developing with axial rotation of a subserous myoma.

Inversion. Inversion of the uterus caused by a submucous fundal myoma has been described already in the previous chapter.

Capsule Rupture. Very rarely a myoma may burst through its capsule and be extruded almost completely either into the peritoneal cavity or into the broad ligament. Rather similar cases are those when one of the large veins on the surface of the subserous myoma ruptures and causes diffuse intra-peritoneal bleeding with

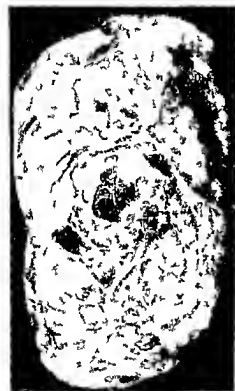


FIG. 183. Angioectatic myoma.

the symptoms and signs of internal hæmorrhage. Fortunately, this complication of myomata is rare.

Adnexal Disease

It is well known that inflammatory lesions of the uterine adnexa are often found coincidentally with myomata at operation. It has been computed that such adnexal lesions can be demonstrated in 15 per cent. of all cases of myomata. Mostly the appendages are surrounded by adhesions but one or other

Fallopian tube may be converted into a hydrosalpinx or pyosalpinx

Even if there is no evidence of past adnexal inflammation the ovaries may be pathological, in that they contain hæmorrhagic follicles and follicular cysts. The ovaries are enlarged and hyperæmic. There is no pronounced association between tumours of the ovaries and myomata

Lymphangiectasis and Telangiectasis

Dilatation of lymphatic channels in the substance of a myoma is not uncommon. The tumour becomes soft and almost cystic to palpation, and when cut exudes large quantities of clear yellow fluid. The walls of the dilated spaces are smooth and glistening, and are found on microscopical examination to be lined by endothelium. There is some evidence that the lymphatics of a myoma do not penetrate through the capsule of the tumour to communicate with the lymphatics of the myometrium, but that they discharge themselves directly into the veins. Little is known of the causation of lymphangiectasis. Dilated lymphatics are, however, found very frequently along the main uterine vessels in cases of large myomata

A somewhat similar condition of the blood vessels is sometimes found in the substance of myomata, and the cases are of considerable pathological interest, for the tumours are of the nature of angiomyomata, rather than simple myomata

Inflammatory Changes in Myomata

Infections arise most frequently with submucous myomata and myomatous polypi, for the blood supply to the lower pole of such tumours is impoverished, and this part of the tumour, by projecting into the cervical canal, or even into the vagina, comes into contact with the organisms which form the vaginal flora. It is not uncommon with large polypi for there to be circulatory disturbances at the pedicle, so that the lower pole of the tumour is congested and readily infected. The surface becomes inflamed and ulcerates, and discharges a sanguinous purulent fluid into the vagina. The infection may spread upwards and involve the endometrium of the uterus itself, and it is not uncommon after the removal of such polypi for a moderately severe degree of uterine sepsis to be lighted up. The worst cases of infection and even of gangrene are seen in puerperal cases when, after delivery, a submucous myoma

leads to myocardial degeneration. Similarly, it is very common for patients with myomata to complain of indigestion.

As a result of myocardial weakness, anæmic patients with myomata are apt to develop thrombosis both before and after operation.

Abdominal Swelling In a fairly large proportion of cases of myomata the patient's attention is first directed to an abdominal swelling. It should be remembered that subserous tumours may be accompanied by no menstrual disturbances or pressure symptoms, so that the first indication to the patient that something is wrong is the development of an abdominal tumour.

Physical Signs and Diagnosis

In the typical case the patient is aged about (40), either nulliparous or having had only one or two children some years before. The patients often have attractive personalities and are free of the depressions and introspections which mark the majority of gynaecological patients. Quite often they have a good colour, but if there has been much menorrhagia the mucous membranes are pale and the complexion sallow, although some degree of malar flush persists until a high degree of anemia has been reached.

The typical history is one of increasing menorrhagia associated with pressure symptoms and the development of an abdominal tumour. In the typical case the abdomen is found distended below the umbilicus and an abdominal swelling may be visible. On palpation a tumour is found arising from the pelvis. It is hard and firm with a smooth surface, although several smooth oval swellings may be palpated attached to each other. The swelling is movable from side to side, from before backwards, but with little mobility from above downwards. The swelling is harder and firmer than the pregnant uterus, not so tense or painful as the full bladder, and not cystic like the common form of ovarian cyst. The swelling is dull on percussion and is not accompanied by ascites. Quite frequently a souffle can be auscultated over the swelling. On vaginal examination the physical signs differ according to the position of the tumour. With intramural and subserous tumours the cervix is found to be continuous with the abdominal swelling, and movements transmitted to the cervix are communicated to the abdominal tumour, and conversely, movement of the abdominal tumour

leads to movement of the cervix. If the diagnosis is to be made with precision the position of the body of the uterus must be established. If the body of the uterus can be identified separate from the abdominal swelling, the latter is more likely to be an ovarian tumour or a subserous pedunculated myoma. Both the uterus and the cervix may be displaced from their normal positions by myomata. For example, a myoma attached to the back of the uterus may push the uterus and cervix forwards and in extreme cases the cervix may be displaced upwards and forwards, above the level of the symphysis pubis, and be out of reach of the examining finger. With large cervical myomata the cervix is usually displaced upwards while the body of the uterus, not appreciably increased in size, rests on the top of the swelling. Broad ligament tumours displace the uterus to the opposite side and myomata of the utero sacral ligaments displace the uterus upwards and forwards.

With submucous myomata and with myomatous polypi which lie above the level of the external os, the cervix is often drawn up so that its vaginal portion is short and squat. In other cases the lower pole of the myomatous polypus can be palpated by a finger placed through the external os, while if the polypus projects into the vagina the pedicle can be palpated passing upwards through the cervical canal. The possibility of the existence of chronic inversion caused by the tumour must be borne in mind, and the diagnosis established by the methods described on p. 441.

Small tumours lying in the pelvis do not cause abdominal swelling, but such cases rarely cause difficulty in diagnosis because on bimanual examination the uterus is found to be enlarged and hard, with a bossed irregular surface. Some submucous tumours and some myomatous polypi may measure as much as 4 in. in diameter, and although lying mainly in the pelvis may be palpated on abdominal examination.

Although the diagnosis of uterine myomata is usually easily made some cases present very great difficulty.

Differential Diagnosis

Abdominal Swellings. A large single intramural myoma with cystic degeneration may be mistaken for an ovarian cyst. A large ovarian cyst is, however, either manifestly cystic or tense, and bimanual examination should ensure the separate identification of the uterus from the tumour. Moreover, a large ovarian

cyst rarely causes menstrual disturbances and may arise at any age. A tense tender tumour projecting anteriorly in the midline should always be suspected of being the full bladder, and when necessary the patient should be catheterised to exclude this possibility.

The possibility of the abdominal swelling being the pregnant uterus should always be borne in mind. It is extremely rare for a pregnant woman to have uterine hæmorrhage at regular intervals after the third month and consequently if a patient is found to have a large abdominal swelling and gives a history of menorrhagia or regular menstruation without any period of amenorrhœa it is unlikely that she is pregnant. Moreover, in pregnancy the vagina and cervix are softened and a mauve discoloration may be detected in the vagina. In some cases of myomata the breasts show some degree of activity so that clear secretion can be expressed but this activity is never of the same degree as that met with during pregnancy. The veins on the surface of the breasts are not dilated and the development of a secondary areola is unknown. If the tumour extends high in the abdomen and is the pregnant uterus, either foetal movements or a foetal heart will be auscultated, and with such patients the tumour may be felt to contract under the hand. A hydatidiform mole may cause rapid enlargement of the uterus and be associated with irregular vaginal bleeding and the abdominal swelling may be firm and hard, like a uterine myoma. But the other symptoms and signs of pregnancy will then be present. If any doubt remains about excluding pregnancy, a Zondek Aschheim test of the urine should be carried out. It may sometimes be clear that the uterus contains myomata but the question has to be answered whether it is pregnant as well. Often great difficulty may be experienced in arriving at the correct diagnosis. It is better, however, to take pains to carry out every investigation, including even the Zondek Aschheim test, than to open the abdomen unnecessarily.

One of the classical mistakes in gynecological diagnosis is to fail to distinguish between bilateral malignant solid ovarian tumours adherent to the uterus and myomata. The diagnosis may be impossible in spite of every care taken over the history and examination, so that the exact diagnosis is made only at abdominal operation. Most malignant ovarian tumours are, however, associated with ascites, and the presence of metastases in Douglas's pouch can be detected through the posterior fornix.

In other cases adnexal inflammatory tumours, like pyosalpinx, may cause difficulty in diagnosis if the swelling is adherent to the uterus, and from time to time mistakes are made with ectopic gestations so that peritubal hæmatocœles are regarded as subserous myomata. In both types of case care taken over the elucidation of the menstrual history will be of the utmost service in establishing the diagnosis.

Lastly, such abnormalities as bicornuate uterus may cause difficulty in diagnosis.

With small myomata and myomatous polypi yet other difficulties arise in the establishment of a correct diagnosis. Persistent bleeding from a bulky uterus in a multipara of 50 would lead to suspicion of carcinoma of the body of the uterus, and the cavity of the uterus should be explored to establish the diagnosis. Similarly a myomatous polyp lying in the cervical canal must be distinguished from retained products of conception, from chronic inversion, and from a malignant growth. If the tumour which lies within the cervical canal is friable and bleeds easily, it is unlikely to be a myoma. With cases of carcinoma of the cervix a cauliflower like growth may sometimes be mistaken for a myomatous polypus. If there is any doubt about the diagnosis a biopsy should be performed.

Treatment of Myomata

In almost all cases of myomata, treatment is necessary, either because of excessive hæmorrhage or because of pressure symptoms. Occasionally, however, cases are seen where no treatment is necessary. In patients of post menopausal age myomata may be discovered during routine examination and if the patient is symptomless, immediate treatment is not necessary. Nevertheless, the case should be watched and if there is any suspicion of further growth of the tumour, operation is clearly indicated for such growth would be suggestive of the development of sarcoma. Needless to say, the diagnosis must be made with absolute confidence. If, for example, the tumour happens to be an ovarian swelling, and not a myoma, an unpardonable mistake will be made. Similarly, symptomless myomata found during the child bearing period of life in women who are bad subjects for operation do not require treatment, but there must be no doubt about the diagnosis before this course can be followed. Symptomless myomata are usually of the subserous type. The majority of other forms require treatment.

In general, treatment may be conservative, radiological, or operative

Conservative Treatment

From time to time patients are seen who have small myomata in the uterus which produce few, if any, symptoms. If such patients are likely to marry and have children, or if they are newly married and anxious to have a family, it is better to avoid operation or radiological treatment until the woman has had a chance to conceive. In the meantime, menorrhagia should be treated by rest and the administration of ergot. Such cases are by no means infrequent, and patients should be examined from time to time so that any rapid enlargement of the tumour may be detected. In practice, the question often arises as to whether a woman should be informed if she has small myomata in the uterus. If a woman is likely to conceive fairly soon after the diagnosis is made it is as well to inform her of the presence of the myomata but it should be pointed out that the tumours though frequently becoming painful during pregnancy, have a well marked tendency to retrogress during the puerperium.

Treatment of Anæmia The profound anæmia which may be caused by myomata should be treated prior to the adoption of either radiological or operative treatment. It is highly dangerous to operate upon a patient with a hæmoglobin value of under 30 per cent. Blood transfusion is the most useful method of treating this anæmia for its results are immediate so that operation can be performed before the next period begins. A long period of rest in bed during which time the patient is treated with iron and arsenic and liver extract though theoretically commendable has the disadvantage that an excessive menstrual period may start during the treatment. It is much better to treat by blood transfusion followed by operation within a few days. After operation the usual treatment for secondary anæmia can be carried out.

Radiological Treatment In recent years there has been a well marked tendency to adopt radiological measures in the treatment of uterine myomata. The principles of treatment both with X rays and radium will be considered in Chapter XXII. The effect of X rays and of radium is to produce an inhibition of ovarian function so that menstruation ceases. Furthermore the myometrium atrophies and simultaneously, mainly no

doubt because of a reduction in their blood supply, the myomata atrophy. As a result the patient is cured of menorrhagia and the pressure symptoms are relieved. Both with X rays and with radium the primary effect is ovarian, and the cessation of ovarian function leads to the development of menopausal symptoms. Radiological measures ought never to be employed in patients younger than forty except when contra indications to operation exist, and the myomata symptoms are exceptionally severe. The best results are obtained with women of menopausal age when the menopausal symptoms arising after the radiological treatment are of no great severity. With X rays there is no primary mortality, with radium treatment the patient must be anaesthetised for the tube of radium to be introduced into the uterus, but the risks to life of an operation of this kind are negligible compared even with the low mortality of surgical treatment. The basis of the radiological treatment of myomata depends upon the selection of the right type of case. The treatment is contra indicated in the following circumstances —

(1) If there is any doubt about the diagnosis or if there is suspicion of adnexal inflammation, then operative treatment is the method of choice.

(2) With myomatous polypi and submucous tumours little benefit is to be expected, while much harm may be done by lighting up infection.

(3) With giant tumours it is far better to treat by operation, partly because X rays treatment is sometimes unsuccessful, and partly because the tumour cannot be expected to shrink and become dwarfed in the pelvis.

(4) If a woman is under forty, X rays treatment is to be condemned, not merely because of the intensity of the menopausal symptoms, but because women sometimes develop severe *kraurosis of the vulva*, with attendant pruritus and discharge, which may outstrip in severity the symptoms caused by the myomata.

(5) If there is any suspicion of carcinoma of the body co existing with the uterine myomata operative treatment is to be preferred.

(6) In rapidly growing tumours in women of post menopausal age the possibility of the development of sarcoma should lead to operative treatment being preferred to the use of X rays.

Although X rays treatment gives extremely good results in selected cases and has no mortality, it must be remembered

that the succeeding period after the radiological treatment is often excessive and patients may have as many as two more periods after the treatment has been used. Another difficulty is that the treatment is useless if a sarcoma has developed in the myoma. On the other hand, in such cases the prognosis is bad, whatever method of treatment is undertaken.

The use of radium should be restricted to cases in which the uterus is only slightly enlarged, in women of menopausal age. It is highly dangerous in cases of submucous myomata and myomatous polypi, for it causes local necrosis and may lead to severe sepsis in the pelvis. It is of little value with large tumours, for the ovaries are too far away to be affected by the radium emanations. On the other hand in women of menopausal age with irregular or continuous hæmorrhage, who have small myomata the treatment is of value, for the patient is anæsthetised and the uterus curetted to exclude the presence of carcinoma of the body of the uterus. While the patient is under the anæsthetic the radium tube can be introduced. After radium treatment, there is again a tendency for the succeeding period to be excessive and most patients have a purulent offensive discharge for six weeks after the treatment.

Operative Treatment

The operative treatment of uterine myomata represents one of the most satisfactory applications of surgery. The mortality is low, the patients are cured of their symptoms, and the part removed is in the average case a useless structure.

The methods available are myomectomy, in which the tumours are removed and the uterus conserved, subtotal hysterectomy, in which the body of the uterus is removed but the cervix left, and total hysterectomy, when both body and cervix are excised.

Myomectomy. The removal of a myomatous polypus by the vaginal route represents one form of myomectomy and will be considered later in the chapter.

Abdominal myomectomy is performed through the peritoneal cavity with the patient lying in the Trendelenberg position. The treatment is theoretically ideal for women who are anxious to have children or who are sterile and in whom the sterility is perhaps attributable to the myoma. The most suitable case for myomectomy is therefore a woman in the early thirties, recently married, anxious to have children, who has one or

only a few myomata. On the other hand, a woman over 40 with living children, whose uterus is studded with multiple myomata, is best treated by hysterectomy. In the operation of myomectomy the myometrium over the tumour is incised and the tumour shelled out from its capsule. With a little

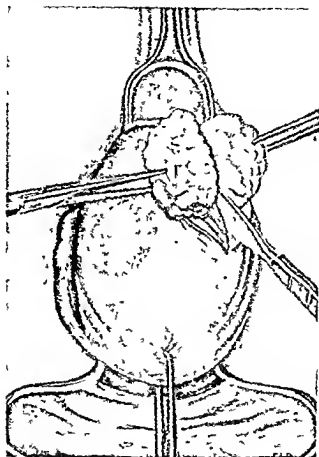


FIG. 184. Abdominal myomectomy. With small myomata the position of the capsule is found by incising into the tumour (After Halban.)

ingenuity other intramural tumours can usually be removed either through this incision or through a second incision made through the opposite pole of the uterus. Subserous tumours are easily removed. Although a conservative measure, myomectomy has certain disadvantages as compared with hysterectomy. In the first place, severe hæmorrhage may be experienced during the operation in spite of temporary clamps

being applied to the main uterine vessels. Secondly, although extreme care may be taken to obtain exact apposition of the edges of the wound in the wall of the uterus, reactionary hæmorrhage may occur into the peritoneal cavity and cause a hæmatoma which, even if it does not become infected, may lead to the production of adhesions with their attendant risk of acute intestinal obstruction. Lastly, small seedling tumours unobserved at operation may subsequently grow, so that hysterectomy

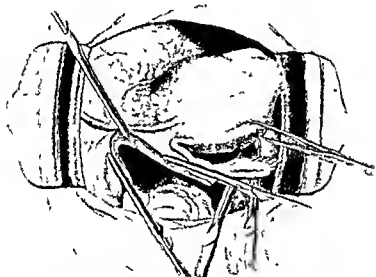


FIG 185. Hysterectomy with the removal of the left adnexa. The infundibulo-pelvic ligaments have been divided between clamps. The uterus is pulled over to the right and a clamp is placed on the round ligament. (Pelham Amreich.)

tomy finally becomes necessary. For these reasons it is probably better to restrict the use of the operation only to those cases when the patient insists upon retaining the uterus so that she may have a chance of carrying a child to term.

Hysterectomy. Hysterectomy is the operation most frequently performed in the surgical treatment of uterine myomata. The ovaries should be retained if possible; if both are removed the patient will develop menopausal symptoms. It is true that adnexal complications such as salpingo-oöphoritis and chocolate cysts are encountered from time to time, which necessitate the

removal of both ovaries, but wherever possible one ovary should be left behind. There has been much dispute as to whether the cervix should always be removed, or whether only a subtotal hysterectomy is necessary. If the cervix is conserved it may subsequently become carcinomatous in about one in 150 cases, and this incidence has been used as an argument for total hysterectomy in all cases. If a hysterectomy is to be undertaken and the cervix is lacerated, eroded, or chronically inflamed, the

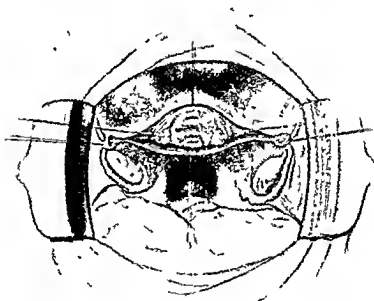


FIG 186 Operation of subtotal hysterectomy after the removal of the uterus and after ligature of the uterine vessels and the adnexal stumps (Peham-Amreich)

whole uterus should be removed, both body and cervix, instead of a subtotal hysterectomy being performed. If a woman is a virgin or nullipara there is no point in removing the cervix. Total hysterectomy is technically more difficult, with a greater risk of injury to bladder and ureters than subtotal hysterectomy. Again, in total hysterectomy the parametrium is divided and the venous plexuses around the cervix and bladder may cause troublesome hæmorrhage. Also, infection may spread from the vagina and cause suppuration in the wound area in the pelvis, which may lead to the formation of a pelvic abscess. After subtotal hysterectomy the cervix is supported by the retinaculum

has been computed that the average duration of life from the commencement of symptoms is about two years

Sarcoma of the uterus is diagnosed prior to the removal of the uterus only very exceptionally. With mucosal tumours which produce continuous bleeding, a histological examination of curettings may enable a diagnosis to be made. Again, rapid enlargement of a quiescent myoma in a woman of post menopausal age is almost pathognomonic of sarcomatous change. Sarcoma of the uterus usually causes rapid enlargement of the uterus with profuse and irregular vaginal bleeding. After metastases have formed, the diagnosis may be made if the uterus is found to be enlarged.

Apart from the grape like sarcoma of the cervix the diagnosis of sarcoma of the uterus is made usually after the uterus has been removed for a suspected myoma. The subsequent treatment consists in the use of deep X rays therapy.

Grape like Sarcoma of the Cervix

Uterine sarcomata arise typically in the body of the uterus, while sarcomata of the cervix are very rare, and in this way sarcoma of the uterus differs essentially from carcinoma of the uterus. The grape like sarcoma of the cervix is a very rare tumour, of great pathological interest, which is well known because of its arborescent structure and its grape like vesicles. Pathologically the tumours should be regarded as mixed tumours for they often contain cartilage, striated muscle fibres, glands, and fat. The stroma is embryonic in type, similar to the embryonal mesenchyme. Grape like sarcoma of the cervix arises typically in adult women, metastases develop rapidly, and local recurrence follows their removal.

Somewhat similar tumours are known to develop in the vagina in children at a very early age, and such tumours contain striated muscle fibres and an embryonic stroma. Again rather similar tumours sometimes develop in the body of the uterus in old women, and in this way three types of mixed tumours, namely, the vaginal tumours of children, the grape like sarcoma of the cervix, and the mixed tumours of the body of the uterus of old women, can be distinguished. Clinically the tumours are of little importance because of their rarity. In all cases the prognosis is bad, rapid recurrence following their removal.

CHAPTER XXI

NEW GROWTHS OF THE UTERUS

EPITHELIAL TUMOURS OF THE UTERUS

Carcinoma of the Uterus

CARCINOMA of the uterus is of two main types, carcinoma of the body, when the growth arises from the endometrium of the body, and carcinoma of the cervix, when the growth develops either from the squamous epithelium of the portio vaginalis or from the mucous membrane of the cervical canal

The two growths differ in almost every respect, particularly in their pathology, incidence and malignancy, although both arise in the same organ

CARCINOMA OF THE CERVIX

Carcinoma of the cervix is one of the commonest of malignant growths, the tumour arising as frequently as carcinoma of the breast. The tumour is much more common than carcinoma of the body of the uterus, the incidence of carcinoma of the body of the uterus being only between 5 and 10 per cent. of cases of carcinoma of the uterus

Ætiology

Carcinoma of the cervix arises most frequently in multiparous patients, nulliparæ comprising only between 5 and 8 per cent. of cases. Carcinoma of the cervix arises very rarely indeed in virgins, women who have borne large families are more apt to develop it than women who have had only few children. Again, the age incidence of the growth depends upon the parity of the women. In nulliparæ the average age-incidence is about 57, whereas with six parous women the age-incidence falls to an average of about 39. It follows that child bearing has some influence upon the development of the growth. Scarring of the cervix as a result of child birth, chronic cervicitis, particularly with ectropion, and chronic discharge are generally regarded as

contributory factors, although they should not necessarily be considered precancerous conditions. The age incidence is as follows —

Under 20	—
20-30	3.6
30-40	21.7
40-50	36.7
50-60	23.8
Over 60	11.1

Pathology

It is customary to identify two groups of cases of carcinoma of the cervix. In the first, the carcinoma arises from the



FIG. 191. Endocervical carcinoma of the uterus.

squamous epithelium covering the vaginal portion of the cervix, while in the second type the carcinoma develops from the mucous membrane of the cervical canal, and is referred to as endocervical carcinoma. Endocervical carcinoma is less common than carcinoma of the vaginal portion, probably only about 10 per cent. of cases being endocervical in type. Growths which arise from the squamous epithelium covering the portio vaginalis are squamous epitheliomata, although the production of

epitheliomatous pearls is relatively uncommon. It should be remembered, however, that the normal squamous epithelium covering the portio vaginalis develops by metaplasia from transitional epithelium during intra uterine life. Perhaps because of this, the squamous celled growths of the cervix are often densely cellular, with a tendency to form areas of adeno



FIG 192 Cauliflower type of carcinoma of the cervix



FIG 193 Cauliflower type of carcinoma of the cervix. The body of the uterus lies above, while the rounded mass in the lower part of the specimen is a large fungating carcinoma of the cervix

carcinoma. Pure adenocarcinomata of the cervix arise from the mucous membrane of the cervical canal. There is, therefore, a tendency for squamous celled growths of the cervix to differ in their characteristics from the typical squamous celled epitheliomata of the skin.

Carcinoma of the vaginal portion of the cervix assumes one of three types. It either takes the form of a proliferating cauliflower like growth which projects into the vagina, or it may develop as an excavating ulcer, or again, it assumes the form

of a raised flat induration. The cauliflower or exophytic growths are very vascular and produce profuse vaginal bleeding, and, because of infection and necrosis, lead to an offensive vaginal discharge. The excavating or endophytic form does not lead to such profuse hæmorrhage, the main symptom being bloodstained discharge. The tumours can be graded histologically by the appearance of the cancer cells, the cells being

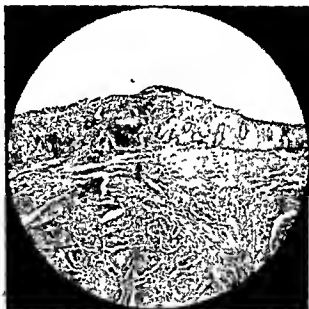


FIG 104 Early carcinoma of the cervix. Above and to the right lies normal squamous epithelium, while to the left and below infiltrating the stroma of the cervix are carcinoma cells. The photograph shows the transition between normal epithelium and carcinomatous tissue.

embryonic in the most malignant growths, while in the mature forms there is a tendency to the development of epithelial pearls. Difficulty is often experienced in distinguishing early cases from erosions of the cervix. With carcinoma of the cervix, instead of the squamous epithelium of the portio being represented by a basal layer of cubical cells, a middle-celled layer of prickle cells and a superficial layer of horny cells, there is no orderly arrangement and prickle cells may not be demonstrated. Again, the cancer cells differ amongst themselves in size, shape and staining properties, and show active mitosis.

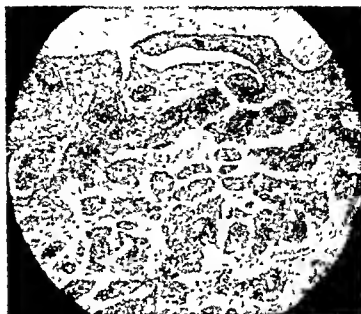


FIG. 105. Carcinoma of the cervix.

Lastly, there is no orderly arrangement with respect to the subjacent tissues, so that the cancer cells penetrate irregularly into the subjacent stroma.

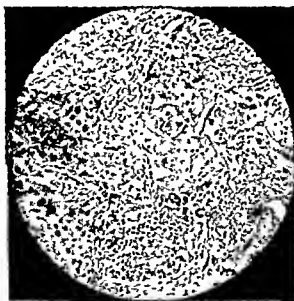


FIG. 106. Carcinoma of the cervix.

Mode of Spread

The growth may spread either by direct spread, by lymphatic permeation, by the blood stream, and lastly by implantation

Direct Spread Direct spread is best represented by involvement of the vagina. In autopsy material the vagina is found

to be infiltrated in about 80 per cent of cases, and with advanced growths the carcinoma may spread far down the anterior vaginal wall. When the growth involves the upper part of the anterior vaginal wall, it can easily reach the bladder so that a vesico-vaginal fistula is a frequent complication in late cases. On the other hand, involvement of the rectum is very exceptional, for the growth must track down the posterior vaginal wall beyond the lower level of Douglas's pouch before the rectum can be infiltrated.

Quite often the growth spreads upwards and involves first the upper part of the cervix and may then reach the body of the uterus infiltrating either the endometrium or myometrium. Involvement of the body



110 197 The uterus and upper part of the vagina from a case of carcinoma of the cervix. The uterus has been opened and the dark area in the specimen shows where the growth had ulcerated through the wall of the uterus.

of the uterus is necessarily more frequent with endocervical carcinoma.

Involvement of the Fallopian tubes and ovaries is very rare, although the invasion is recognised.

The parametrium is usually infiltrated quite early. Probably in the early stages the cancer cells permeate along the lymphatics which lie near Mackenrodt's and the utero sacral ligaments, and by eroding through the lymphatic channels involve the

parametrium In late cases the growth spreads directly into the parametrium and causes fixation of the uterus The involvement of the parametrium is detected clinically by fixity of the uterus and by palpating the parametrium by rectal examination When the involvement of the utero sacral ligaments is extensive the bowel may be partially stenosed, and some degree of proctitis may be set up

The bladder is involved in the majority of late cases, the growth extending either directly from the supravaginal portion of the cervix or after it has involved the upper part of the anterior vaginal wall First the patient complains of frequency and pain on micturition, then cystitis and hæmaturia arise, and lastly a vesico vaginal fistula develops, with incontinence of urine The ureters become involved when the growth invades the parametrium, and occlusion of the ureters leads to the development of hydronephrosis Fifty per cent of patients with carcinoma of the cervix die from uræmia as the result of invasion of the urinary tract with subsequent urinary infection

Lymphatic Permeation The lymphatic drainage of the cervix is to the small glands in the parametrium, the sacral, and the hypogastric glands The hypogastric glands which are particularly involved are those which lie below the level of the bifurcation of the common iliac artery In carcinoma of the cervix the glands may be involved early in the course of the disease, and as they cannot be palpated by bimanual examination it may be difficult to determine how extensive the case may be, except by abdominal operation It is rare for the aortic and lumbar glands to be infiltrated with growth, most patients dying before the growth extends out of the pelvis

In some advanced cases of carcinoma of the cervix the cancer cells spread down the anterior vaginal wall deep to the epithelium and finally ulcerate through the skin in the region of the vestibula Such cases are attributed to retrograde lymphatic or venous spread

Blood Stream As the venous drainage of the cervix belongs to the systemic and not to the portal system, metastases in the liver in cases of carcinoma of the cervix are uncommon It is indeed very exceptional for carcinoma of the cervix to spread by way of the blood stream, but cases arise from time to time at the present day after radium treatment The growth then metastasises in the lungs and kidneys, but this method of dissemination is exceptional

Implantation Implantation was illustrated by the growths which developed in the upper part of the vagina after hysterectomy before the technique was introduced of closing the vagina with a clamp prior to the removal of the uterus. Apart from such examples implantation is a rare method of spread for the metastases which form at the vulva are now regarded as arising by retrograde lymphatic spread.

Metastases in distant organs are found in about 60 per cent of cases at autopsy. But except for advanced cases it is rare to find dissemination of the carcinoma outside the pelvis.

Symptoms

There are four main symptoms of carcinoma of the cervix, namely hæmorrhage, discharge, cachexia and pain. Other symptoms develop in late cases but are not so important in diagnosis for by then the recognition of the presence of the carcinoma of the cervix offers no difficulty.

Hæmorrhage The typical hæmorrhage with carcinoma of the cervix is superimposed upon normal menstrual bleeding so that in the early stages the woman can distinguish that in addition to her normal menstruation she has irregular hæmorrhage. In most cases the hæmorrhage ensues upon coitus and takes the form of a trickle of blood which may persist for several days. Strains and other exertions may initiate the hæmorrhage which tends to persist for a longer time the more advanced the growth becomes. Vaginal bleeding in women of post-menopausal age should always be suspected as being caused by carcinoma of the cervix, and all parous women with inter-menstrual bleeding of any type or with any form of vaginal bleeding superimposed upon normal menstruation should always be examined vaginally to exclude the presence of carcinoma of the cervix. Women expect some irregularity of the menses when they reach menopausal age and are apt to regard any irregular bleeding as being of the menopausal type. In consequence they are reluctant to be examined vaginally, but medical practitioners should insist upon a careful vaginal examination both digital and visual, to exclude the presence of carcinoma of the cervix. As with most forms of carcinoma early cases respond well to treatment whereas with late cases the possibility of obtaining permanent cure or even some measure of relief is small. The cauliflower type of growth is

usually very vascular and is apt to bleed vigorously on touch, or even with speculum examination. If severe vaginal bleeding follows upon simple digital examination of the cervix it is almost certain that the patient has a carcinoma there. With endophytic growths and those which are scirrhus in type, bleeding is not a well marked symptom, and some patients may complain only of an offensive discharge, but such cases are relatively uncommon. Sometimes the vaginal bleeding is very severe and a high degree of anemia results, but it is very rare for the hæmorrhage to be fatal. The source of the hæmorrhage is the dilated capillaries of the vascular growth.

Discharge The vaginal discharge in carcinoma of the cervix is bloodstained and has a characteristic offensive odour. The discharge originates from necrotic areas on the surface of the growth, and the degree to which it is bloodstained depends partly on the vascularity of the carcinoma and partly upon trauma. With endophytic growths offensive vaginal discharge is often a more dominant feature than irregular hæmorrhage. In women of post menopausal age a watery vaginal discharge may be complained of as the earliest symptom.

Cachexia Cachexia is well marked in advanced cases. The woman is anæmic and shows symptoms and signs of incipient uræmia, with loss of appetite, headaches, and sickness.

Pain Pain is nearly always a late symptom. If the growth infiltrates the parametrium, some degree of parametritis is lighted up so that pelvic pain develops. If the glands below the bifurcation of the common iliac artery are extensively infiltrated with carcinoma, the obturator nerve becomes involved and the woman develops referred pain in the knee and along the inner side of the thigh. Again, if the bladder is infiltrated with growth, urinary symptoms and pelvic pain develop, while in advanced cases if the carcinoma spreads laterally and backwards to the pelvic wall, the sacral plexus may be infiltrated with growth, with resultant pain along the back of the thighs.

Other symptoms, such as painful and frequent micturition, incontinence of urine due to vesico vaginal fistula, painful defæcation because of proctitis, and pruritus because of vaginal discharge, arise in late cases.

Physical Signs

Just as there are four main symptoms of carcinoma of the cervix, so there are four main physical signs. In the first place

the cervix bleeds on touch, secondly, it is friable, thirdly, the malignant area is either infected or necrotic, and fourthly, there is induration either of the cervix itself or in advanced cases in the surrounding structures

In most cases digital examination of the cervix is followed by profuse vaginal bleeding. The bleeding is particularly well marked when the growth is of the cauliflower type, but with endophytic tumours the bleeding is not so severe although it always arises if the examining finger is pressed firmly into the growth. The bleeding is caused by trauma, small capillaries being opened up when the growth is broken up by the examining finger. Scirrhus tumours are less friable and not so vascular as exophytic growths. Bleeding on examination is a physical sign not restricted to carcinoma of the cervix for it is present with vascular erosions, mucous polypi, myomatous polypi, and retained products of conception.

The carcinomatous area is friable, but again the degree of friability depends upon the type of growth, the papillary forms being easily broken up by the examining finger while hard scirrhus endophytic tumours are less friable. If the cervix is examined with a speculum it will be found that a blunt probe can be pushed into the tissues of the growth while the healthy non malignant tissues of the cervix are resistant. Again, the more friable the growth the more bleeding follows the examination. Friability is one of the most important signs of carcinoma of the cervix. Myomatous polypi are not friable, mucous polypi and vascular erosions are not broken up by the examining finger, but retained products of conception projecting through the cervical canal are as friable as very vascular cauliflower growths of the cervix.

The third sign, infection and necrosis of the malignant area, can be detected only by speculum examination of the cervix, when the malignant area is seen to be vascular and ulcerated, discharging blood and pus into the vagina. In advanced cases the superficial parts of the growth become necrotic so that minute grey sloughs are scattered over the surface of the tumour. It should be remembered, however, that the lower pole of a myomatous polypus is usually infected and necrotic, and the rare growths, grape like sarcomata of the cervix, have a similar appearance. Again, retained products of conception are nearly always infected if they project through the cervical canal.

The fourth sign is induration. In advanced carcinoma of the

cervix there is well marked induration of the cervix and surrounding tissues, so that the cervix is fixed. In early cases the induration may be difficult to detect, particularly if the growth is of the exophytic type. The induration may be detected in the parametrium, particularly along the utero sacral ligaments if a rectal examination is made.

In advanced cases other physical signs may develop. The growth may extend along the vaginal walls or it may extend forwards towards the base of the bladder, when a firm induration may be detected above the level of the anterior fornix. If a vesico vaginal fistula has developed there is incontinence of urine, and urine may be seen trickling down the vagina. It is rare for affected lymphatic glands to be palpable either by abdominal or bimanual examination. If the growth has extended far along the utero sacral ligaments a rectal examination will demonstrate this induration, and in very advanced cases there may be some degree of stenosis of this part of the bowel. It has already been pointed out that it is rare for metastases to be found above the level of the pelvic brim. The metastases which form at the vulva by retrograde spread along the lymphatics which lie deep to the anterior vaginal wall are only seen in advanced cases.

With endocervical eucarcinoma the cervix is expanded and firm. Often the external os is dilated so that the finger placed in the cervical canal palpates the friable growth. At other times although the external os is closed, the growth may infiltrate downwards and be visibly infiltrating the tissues around the external os. Hæmorrhage always follows bimanual examination in cases of this kind.

The general signs of anæmia and cachexia are found with advanced cases.

Diagnosis

The history given by the patient should lead to the suspicion of the presence of a carcinoma of the cervix, and it is important always to examine the patient carefully and not to dismiss the case as one of irregular menstruation. As in all branches of medicine, mistakes in diagnosis are usually due to incomplete investigation and to this day, although succeeding generations of medical students have had impressed upon them the importance of examining suspected cases vaginally, a fair percentage of cases of carcinoma of the cervix which are sent up to hospital

have received previous conservative treatment from their medical practitioners before the medical attendant has decided that a vaginal examination has been necessary. Unless a practitioner has considerable skill in gynaecological practice he should always suspect carcinoma of the cervix in any woman with irregular vaginal bleeding. As a general rule, the diagnosis is made without difficulty if the cervix is examined both digitally and visually.

If a carcinoma of the cervix is suspected, a vaginal examination should be made and the cervix examined for the signs of bleeding on examination, friability, infection and induration. Next, the cervix should be examined with a speculum and tested for friability with a blunt pointed probe, if there is any doubt about the diagnosis. If the diagnosis of carcinoma of the cervix is made, the next step is to make a rectal examination and to palpate the utero sacral ligaments to determine the degree of involvement, either by carcinoma or by inflammation. The mobility of the uterus, detected by bimanual examination, will indicate the degree to which the surrounding structures, particularly the bladder and parametrium, are infiltrated by the growth. The body of the uterus should be identified if possible. If it is found to be enlarged the possibility of the presence of a pyometra should always be borne in mind. In some cases of carcinoma of the cervix the growth produces stenosis of the cervical canal and the cavity of the uterus collects secretions which become infected and lead to the formation of a pyometra. If a pyometra is suspected its presence should be excluded before resorting to radium treatment, for the radium emanations are apt to lead to acute sepsis in such cases, which may prove fatal. Similarly, if a carcinoma of the cervix is grossly infected and there is profuse offensive vaginal discharge, radium treatment is very likely to light up sepsis and cause a fatal septicaemia. In some clinics the bacteriology of the cervical discharge is investigated prior to radium treatment, and, if the carcinoma is found to be infected with hæmolytic streptococci, efforts are made by douching and by the application of antiseptics to the growth to reduce the intensity of the infection, prior to radium treatment being adopted.

It is very important to determine whether there is involvement of the urinary tract in a case of carcinoma of the cervix, for the prognosis depends to a great degree upon the extent to which the bladder and ureters are involved in the growth. If

the bladder is infiltrated a history of frequent, painful micturition with pyuria or hæmaturia may be obtained. All cases should be investigated by cystoscopic examination before operative treatment is decided upon. If the bladder is infiltrated with growth the earliest sign of involvement is the development of a bullous œdema at the base of the bladder. In more advanced cases a depression forms, due to contraction of the growth in this situation, while in late cases the growth can be seen by cystoscopy to ulcerate directly into the bladder. The ureteric effluxes should be examined and the excretion of dyes like indigo carmin from the kidney should be noted, and a determination of the blood urea will also be of service in deciding whether the case is favourable or not.

Operability

The investigation of a case of carcinoma of the cervix requires not only the establishment of the diagnosis but also determination of whether the case is operable or not. Signs of inoperability are complete fixity of the cervix, extensive infiltration of the vagina, induration along the utero sacral ligaments as far out as the pelvic wall, together with evidence of induration of the bladder. Moreover, the condition of the patient should be borne in mind. Fat women, old women, and patients with chronic medical diseases such as nephritis and bronchitis are not suitable subjects for extensive abdominal operations.

Prognosis

The degree of spread of the growth will indicate the prognosis. The average duration of life with carcinoma of the cervix after the development of symptoms is about eighteen months. If the vagina is extensively involved, if a vesico vaginal fistula is present, or if there is evidence of pyelo nephritis the prognosis is hopeless, whatever treatment is employed. On the other hand, in early cases, whatever treatment is carried out, whether operative or radiological, the end results are fairly good compared with other forms of carcinoma. Experience shows, however, that with radiological treatment a guarded prognosis should be given. Cases which seem favourable prior to treatment do not necessarily respond well, and, conversely, surprisingly good results may be obtained in advanced cases.

Differential Diagnosis

It has already been stated that the diagnosis is established without difficulty in the average case if the patient is carefully examined. Moreover, the greater the experience of the practitioner the less likely is he to have difficulty in making a diagnosis. Nevertheless, certain conditions may produce rather similar pictures. In the first place, a chronically inflamed cervix with laceration and ectropion may cause discharge and bleeding and give an appearance rather similar to that of carcinoma of the cervix. An area of ectropion is, however, smooth and glistening and not friable. The ectropion may be associated with scarring of the vaginal wall as a result of laceration during child birth, and the scarred area of the vaginal wall may be mistaken for the induration of carcinoma. If there is any doubt in making the diagnosis the practitioner should remove a small piece for histological examination. Even then, great difficulty may be experienced in deciding whether the tissue removed is malignant or not, for with healing erosions the squamous epithelium may grow irregularly and give the appearance of malignant tissue infiltrating the healthy cervix.

Schiller has introduced a clinical test in which the cervix is painted with Lugol's solution. The healthy squamous epithelium covering the portio stains a deep brown, while the high columnar epithelium of an eroded area does not alter its colour. If the area of carcinoma is infected or necrotic the cells do not stain with iodine but prior to ulceration and infection the squamous carcinoma cells appear as grey areas, for they do not contain the glycogen like substance possessed by normal vaginal epithelium. The test is suitable for suspect cases of early carcinoma of the cervix, but its main service is to exclude the presence of carcinoma in a typical erosion.

Sometimes difficulty is experienced in distinguishing between a cauliflower growth of the cervix and various forms of polypi. Mucous polypi do not often give rise to difficulty, for with them, the surface is smooth and glistening. Old standing mucous polypi, however, become covered with squamous epithelium by metaplasia of the original columnar epithelium covering and may project as firm vascular tumours from the cervix into the vagina.

It is rare, however, for such polypi to be ulcerated, and they are never friable. Myomatous polypi are often ulcerated and

may bleed on examination, but their consistence is firm and they have a characteristic spherical shape. Again, a pedicle may be felt passing upwards through the cervical canal towards the cavity of the uterus.

Retained products of conception may project through the cervical canal and give rise to difficulty in diagnosis, for they produce bleeding on examination, offensive discharge, and are friable. A careful investigation of the history should help in establishing the diagnosis and a histological examination of a portion removed for section will establish the diagnosis without difficulty.

The rare tumour, the grape like sarcoma of the cervix, is diagnosed with precision only by histological examination. Sometimes carcinoma of the body of the uterus spreads downwards to involve the cervix, and may project through the external os. The distinction between an endocervical carcinoma and this form of growth is only possible by a histological examination.

Very great difficulty may be experienced in distinguishing between carcinoma of the cervix and a primary sore of the cervix, for a primary sore may resemble very closely an early carcinoma. The diagnosis can be made by histological examination of the portion removed. Later in the course of the disease secondary manifestations of syphilis will develop.

Tuberculosis of the cervix is a very rare disease but it produces an appearance rather similar to that of carcinoma of the cervix. Most cases are seen in old patients and the affected area shows evidence of caseation. Microscopical examination of the portion removed will establish the diagnosis.

Treatment of Carcinoma of the Cervix

The treatment of carcinoma of the cervix is either operative or radiological. Advanced cases are unsuitable for operative treatment and the signs of operability have already been discussed. Extensive infiltration of the bladder, the presence of vesico vaginal fistula, extensive infiltration of the vagina or parametrium, are contra indications to operative treatment. Again, the operations required are difficult and extensive and may be followed by shock, so that unless the general condition of the patient is good, the primary mortality is high. At the present day it is customary to group cases of carcinoma of the

cervix into four stages, depending upon the degree of development of the growth

Stage 1 The growth is restricted to the cervix and the uterus is movable

Stage 2 The uterus retains some degree of mobility The growth does not involve the parametrium to any extent, although it spreads laterally to involve the vaginal wall in the region of the fornices

Stage 3 The mobility of the uterus is restricted and the parametrium is infiltrated with growth The vagina is extensively infiltrated and metastases may be present in the lower part of the vagina

Stage 4 The uterus is fixed both parametria are infiltrated to the pelvic walls and the growth involves the bladder and the whole of the vagina

The classification is imperfect as all such classifications must be, but so far as the practitioner is concerned it indicates to him how cases can be graded according to the extent of the growth Again, it is obvious that Stage 1 and Stage 2 cases may be operable, while no surgeon with a sense of proportion would think of operating upon Stage 3 or Stage 4 cases

The operability rate depends upon other factors than the degree of development of the growth Some surgeons have had vast experience of the operation, are familiar with the technical difficulties and are willing to undertake operation in border-line cases Other surgeons think of the immediate mortality rate of Wertheim's operation which is at least 10 per cent in the best hands and prefer to treat the patient by radiological means which have a much smaller primary mortality Again, the patient may be a bad subject for surgery She may be fat or have chronic medical disease Also the majority of gynaecological surgeons would refrain from operating upon a woman advanced in years however early the growth might be

With surgery the extended abdominal hysterectomy perfected by Wertheim is the operation of choice in this country, although complicated vaginal hysterectomies are still employed on the Continent. Statistics show that whatever method of treatment is employed, whether radiological, Wertheim's operation, or extended vaginal hysterectomy, the percentage of five year cures is the same, so that so far as end results are concerned with a consecutive series of cases seen there is nothing to choose between the individual methods Further, with advanced

cases radiological treatment, consisting of the use of radium combined with X-rays, is clearly the method of choice. With early operable cases good results are obtained both by surgery and by radiology, but radiology has only a small mortality

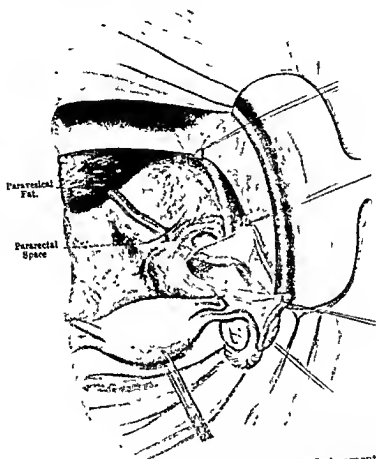


FIG. 198. Wertheim's operation. The round ligament and the infundibulo-pelvic ligament have been divided, and the broad ligament opened up after the separation of the bladder from the uterus. The uterine vessels cross above the ureter almost at right angles. (Peham-Amreich.)

whereas the surgical mortality is high. It should be remembered that radiological treatment is relatively in its infancy and improvement in technique is to be expected in the future, whereas with surgery very little improvement is likely to be obtained. For these reasons the modern tendency is to employ radiological treatment which combines local applications of

radium with deep X rays therapy to the pelvis rather than to refer to surgery

Statistics show that roughly 50 per cent of all cases seen are operable and that about 25 per cent of all cases seen, whether treated by surgery or by radiological means, are free of recurrence after five years. It should be pointed out, however, that recurrence may develop after five years. Indeed, if a patient has once had carcinoma, whatever the method of treatment

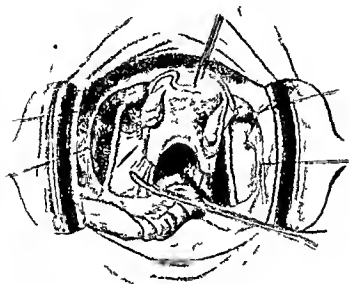


FIG. 109. Wertheim's operation. After division of the uterine vessels and the dissection of the ureters the peritoneum of Douglas's pouch is divided the uterus pulled forward and the utero-sacral ligaments clamped and divided. (Helman, Am. J. Ch.)

employed one can never say that the patient will be permanently cured, for recurrence may suddenly become manifest many years after the initial treatment.

Wertheim's Operation. The operation should be restricted to early cases and the signs of operability have already been described. One of the great advantages of the method is that an opportunity is afforded of inspecting and palpating the lymphatic glands in the pelvis. The vaginal operation for carcinoma of the cervix does not allow the lymphatic glands to be palpated. On the other hand, the modern radiological treatment combines local application of radium with deep

X rays therapy to the whole pelvis, the X rays being used to deal with metastases disseminated either in lymphatic glands or the parametrium at some distance from the cervix

Pre operative treatment consists in improving the general health by rest in bed, by blood transfusion if the patient is

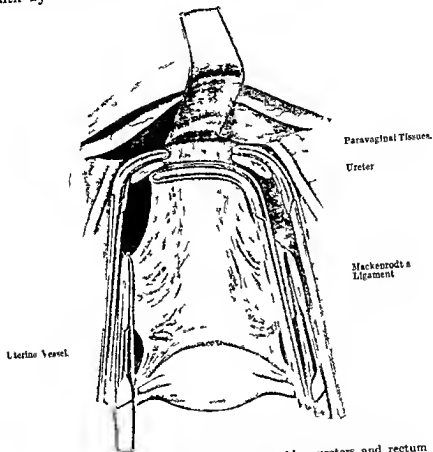


FIG. 200. Wertheim's operation. The bladder, ureters and rectum have been separated, the parametrium divided between clamps and a large clamp placed over the vagina well below the level of the cervix. The vagina is cut through below the level of the clamp (Peham Amreich.)

anæmic, by vaginal irrigations with antiseptics if the growth is infected and necrotic, and also by chemotherapy if the growth is septic. Spinal anæsthesia gives a much better exposure, because of complete relaxation, than inhalation anæsthesia.

The patient is placed in the Trendelenburg position and the abdomen opened by a long subumbilical median incision and the pelvis examined for metastases and the mobility of the

uterus determined. If the case is inoperable the abdomen is closed. If operation is undertaken the utero vesical fold of peritoneum is first incised and the bladder separated from the cervix. If the bladder is extensively involved it is best to stop the operation and close the abdomen. After the separation of the bladder the infundibulo pelvic folds and the round ligaments are divided between clamps as with pan hysterectomy,

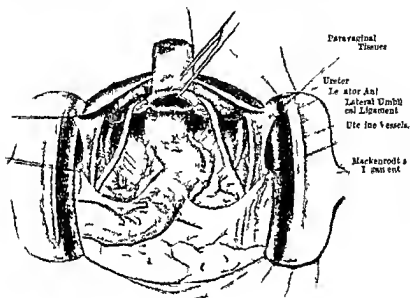


FIG. 201. Wertheim's operation. The appearance of the pelvis at the completion of the operation before covering the raw area with peritoneum. The ureters, rectum and bladder have been cleared of the pelvic cellular tissue and the ligaments have been divided (Peham, Amreich).

and then the uterus is pulled forcibly to one side. The next step consists in dissecting out the ureters from the parametrium and laying them bare along the whole of their length in the pelvis until they enter the bladder. The uterine arteries are now clamped and divided, the ureters retracted out of the way and the parametrium and utero sacral ligaments divided as far from the uterus as is possible. The bladder is now separated from the vagina and the vagina cut through with scissors below the level of a special clamp placed on the mobilised vagina. The purpose of using this clamp is to prevent septic

material from being disseminated over the raw area in the pelvis and also to reduce the possibility of the development of implantation deposits from the cervical growth over the raw area in the pelvis. Any affected lymphatic glands along the internal iliac vessels and below the bifurcation of the common iliac artery are now removed. It is best to drain the raw area into the vagina by packing with gauze. The raw area in the

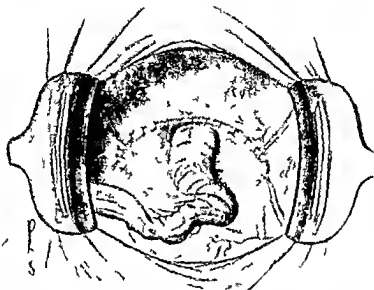


FIG 20. The pelvic peritoneum after the completion of Wertheim's operation. The peritoneum covering the bladder is drawn backwards and sutured to the peritoneal covering of the sigmoid (Feham Amreich)

pelvis is now covered with the peritoneal flaps and the abdomen closed. In favourable cases the operation can be completed within an hour.

Complications which are apt to develop are those mentioned in the previous chapter, where the operation of total hysterectomy was described. After Wertheim's operation the patient is very likely to be severely shocked and has to be treated accordingly. Sepsis taking the form either of local sepsis in the raw area in the pelvis or peritonitis is a common cause of death. The urinary complications are very important. Most patients suffer from retention and urinary infections are very common. Most surgeons advise the use of a self retaining catheter for ten days after the operation. Injuries to the ureters and bladder

may lead to the development of fistula and if both ureters have been ligatured the patient will develop suppression of urine. Further details of the operation are beyond the scope of this book.

Radiological Treatment The details of the radiological treatment of carcinoma of the cervix will be described in the next chapter.

CARCINOMA OF THE BODY OF THE UTERUS

Carcinoma of the body of the uterus is an altogether different form of carcinoma from carcinoma of the cervix. In the first

place the growth is much less frequent carcinoma of the cervix being at least ten times as common as carcinoma of the body. The age incidence is different carcinoma of the body arising most typically between the ages of 50 and 60. The growth rarely arises before the age of 45 but it develops not infrequently in women over the age of 60. The growth occurs most frequently in nulliparae or in women who have had only one or two children many years before. It is very exceptional indeed for carcinoma of the

FIG. 203. Carcinoma of the body of the uterus.

body of the uterus to arise in a woman who has borne a large family.

Pathology

The growth is an adenocarcinoma which starts as a small papillary excrescence from the endometrium of the body of the uterus. Microscopically it has the typical structure of an adenocarcinoma the malignant cells being cubical or columnar in shape larger than the epithelial cells of the healthy endometrium with large nuclei which show mitotic division. The

carcinoma cells infiltrate the myometrium by direct spread and permeate along the lymphatics, but not with the same rapidity as in the case of carcinoma of the cervix.

To the naked eye, in early cases the growth takes the form of a disc-like excrescence from the endometrium, the surface being irregular and vascular, bleeding easily and discharging blood and infected secretions into the cavity of the uterus. With more advanced cases the growth infiltrates the myometrium and spreads over the endometrium as well, so that the uterus

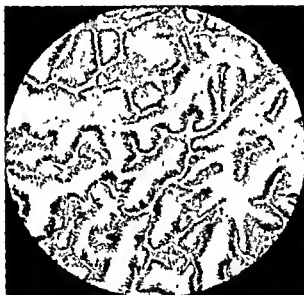


FIG. 204. Carcinoma of the body of the uterus Curettings

becomes symmetrically enlarged and finally the whole cavity of the uterus is lined by friable ulcerated growth.

Lymphatic metastases usually develop late in the course of the disease, the affected lymphatic glands being the hypogastric, the glands below the bifurcation of the common iliac artery, and by way of the ovarian lymphatics the aortic group become involved. In other cases vaginal metastases form by retro-grade lymphatic spread, the metastases ulcerating through the lower part of the vagina. Metastases in the ovaries are not uncommon, particularly when the growth arises in women under the age of 50. Direct spread to the bladder and parametrium is a very late manifestation of carcinoma of the body of the uterus, but it is not uncommon for the carcinoma to spread

downwards and involve the cervix and finally to appear around the external os. Distant metastases arise very exceptionally. In untreated cases the patient dies either from involvement of the urinary tract, from involvement of the peritoneum with multiple intraperitoneal metastases or from cachexia induced by infected growth.

Squamous metaplasia is not uncommon with carcinoma of the body, so that in some areas the growth may simulate a

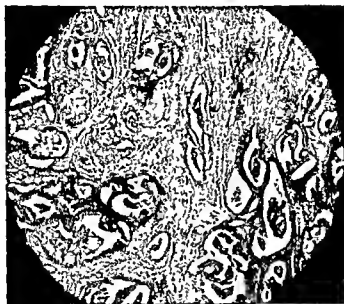


FIG 205 Carcinoma of the body of the uterus. The growth is an adenocarcinoma. The growth is infiltrating the myometrium, which lies above and to the right

squamous-celled epithelioma of the cervix. In other cases if the carcinoma arises low down in the body of the uterus it may cause stenosis so that a pyometra forms above the level of the growth.

Symptoms

The most characteristic symptom with carcinoma of the body of the uterus is post-menopausal hæmorrhage. The bleeding is continuous without rhythm or definite frequency. Mostly the bleeding is slight in amount, severe hæmorrhage being of rare occurrence. The bleeding is usually associated with some

degree of offensive discharge caused by the ulcerated growth but it is not so characteristic a symptom as with carcinoma of the cervix

Pain is sometimes complained of, when it is described as of the colicky type and is attributed to contractions of the uterus. Other symptoms arise only in late cases when for example, the growth infiltrates the surrounding structures or when cachexia has been induced by the presence of an old standing infected growth

Physical Signs

In women of post menopausal age the most certain sign of the presence of carcinoma of the body of the uterus is to see blood being discharged through the external os. The uterus is enlarged in most cases of carcinoma of the body of the uterus, though not appreciably, except with advanced cases. It should be remembered that carcinoma of the body of the uterus tends to develop in patients who are of the type to have uterine myomata, and the possible coincidence of these two tumours should always be borne in mind

The discharge of blood through the external os is not absolute proof of the presence of carcinoma of the body in a woman of post menopausal age. The endometrium can be accurately examined only by curetting and by microscopical examination of the material removed. It follows that although carcinoma of the body may be suspected by routine bimanual and speculum examination, its presence cannot be demonstrated except by curetting. If the material removed during curetting is pale, friable and plentiful, the surgeon should proceed at once with abdominal pan hysterectomy, while if the material removed has not the characteristic macroscopical appearance of malignant tissue, further treatment should be suspended until the microscopical report has been obtained

In the typical case of carcinoma of the body of the uterus the woman is of post menopausal age. In relatively younger women whose menopause is not yet complete the history obtained is usually one of continuous bleeding. The physical signs alone will not allow the diagnosis to be established, so that curetting should always be performed in suspect cases. It follows that all women of menopausal age with continuous bleeding should be investigated by curetting, to exclude the presence of carcinoma of the body of the uterus

Differential Diagnosis

Although the symptoms and physical signs of carcinoma of the body are relatively simple, there is often difficulty in establishing the diagnosis. In the first place, a fair proportion of women with carcinoma of the body are either virgins or nulliparæ, so that a vaginal examination with the use of a speculum may be difficult. In cases of postmenopausal hæmorrhage some form of carcinoma of the genital tract should first be thought of, particularly carcinoma of the cervix, or of the body of the uterus, or of the ovaries. Other growths, such as carcinoma of the vagina and vulva, can usually be demonstrated without difficulty.

Postmenopausal uterine bleeding is a not uncommon symptom with carcinoma of the ovaries, particularly with the rare granulosa cell tumours of the ovaries. If bimanual examination demonstrates the existence of an adnexal tumour in a woman of postmenopausal age suffering from uterine bleeding, it is reasonable to assume that the adnexal tumour is an ovarian growth producing bleeding from the endometrium. The bleeding in such cases is usually due to an oestrogenic proliferation of the endometrium and the correct treatment is to remove the uterus as well as both appendages.

Senile vaginitis causing bleeding and offensive discharge in women of postmenopausal age often gives rise to difficulty in diagnosis. The vaginitis can be recognised by speculum examination of the vaginal wall but the two conditions may be coincident. If there is any doubt, the uterus should be curetted and the curettings examined microscopically.

From time to time small adenomatous polypi develop in the endometrium of the body of the uterus in women of postmenopausal age and give rise to symptoms similar to those of carcinoma of the body. Another difficulty is that the polypi may escape the curette for their pedicles are often small. Curetting will exclude the presence of carcinoma, although it does not necessarily establish the diagnosis of adenomatous polypus.

Very exceptionally myomata become extruded into the cavity of the uterus and cause postmenopausal bleeding, and tuberculosis of the endometrium sometimes causes uterine bleeding when it arises in patients of postmenopausal age.

Prognosis

Carcinoma of the body of the uterus is a much more favourable growth than carcinoma of the cervix, and the duration of life after the development of symptoms is not uncommonly between five and seven years, the average duration of life being at least twice as long as in the case of carcinoma of the cervix. The end results after operative treatment are extremely good, relatively to other forms of carcinoma. In untreated cases death ensues from involvement of the urinary tract, from cachexia, and from disseminations of growth over the peritoneum.

Treatment

The modern tendency with carcinoma of the body of the uterus is to treat cases by surgery rather than by radiology. It is very rare for carcinoma of the body to spread outside the uterus and involve surrounding structures, and permeation along lymphatics to involve lymphatic glands is a relatively late phenomenon. Infiltration into the parametrium is only known with advanced growths which have spread down and infiltrated the cervix. Consequently, an extended hysterectomy operation is unnecessary in cases of carcinoma of the body of the uterus. Pan hysterectomy, in which both tubes and both ovaries are removed as well as the whole uterus, is the accepted method of surgical treatment. Some surgeons prefer to close the external os by suture prior to proceeding with the abdominal operation and so to avoid the risk of implanting carcinoma cells over the bare area in the pelvis. A common procedure is to anaesthetise the patient, and curette the uterus, and if the curettings are obviously malignant, to close the cervix by suture and then immediately proceed with a pan hysterectomy by the abdominal route. The mortality of the operation is small if the patient's general condition is good. With bad subjects for operation, such as those suffering from bronchitis, morbus cordis, nephritis, or adiposity, it is better to treat the case radiologically than to employ surgery. Although there is some difference of opinion at the present day, the general feeling is that carcinoma of the body is best treated surgically wherever possible rather than by radiological means. The radiological treatment of carcinoma of the body of the uterus will be considered in the next chapter.

uterus should be explored by curetting after preliminary dilatation of the cervix, when the polypus can be removed without difficulty. Histologically the polypus consists of degenerate chorionic villi surrounded by blood clot. The differential diagnosis is from chorion epithelioma, so that all material removed must be carefully examined microscopically to exclude this possibility.

Fibrinous Polypi

Fibrinous polypi of the uterus were described in the older gynaecological textbooks, but they do not seem to be recognised at the present day.

Malignant Polypi

Under this heading are described malignant growths which project into the cavity of the uterus to form a polypoidal tumour. Sarcoma of the uterus, carcinoma of the body of the uterus, and sometimes endocervical carcinoma produce polypi of this type.

Uterine Casts

From time to time patients pass from the vagina shreds of material which when examined under water are found to have the shape of the endometrium of the uterus. Occasionally the material consists of the whole of the superficial part of the endometrium which has been shed entire. Two forms of casts are recognised. The first, the **decidual cast**, is extruded in cases of ectopic gestation. In some cases of ectopic gestation the endometrium of the uterus becomes converted into decidua, and after the ovum has died through being dislodged by blood from its site of implantation, the hypertrophic changes in the endometrium of the uterus undergo retrogression and sometimes the whole of the superficial layer of the endometrium is shed entire and forms a decidual cast. The outer surface of a decidual cast is vascular and shaggy, while the inner surface, which corresponds to the smooth lining of the uterus, is smooth and glistening. On histological examination a decidual cast is found to consist of the superficial layer of the decidua of the uterus with crenated dilated glands and large decidual cells in the stroma. A cast of this kind may be confused with the

chorion of an intra-uterine pregnancy. The diagnosis must be made with precision, otherwise the presence of an ectopic gestation may be overlooked. If there is any doubt about the diagnosis, the material should be examined histologically. If chorionic villi are present the pregnancy must have been intra-uterine.

Membranous casts of the uterus are passed in cases of membranous dysmenorrhœa. The membranes are thin and translucent, and consist of the most superficial layers of the endometrium. Histological examination is unsatisfactory because the tissue is degenerate. But areas of necrosis and degeneration can be detected.

Blood casts of the uterus are occasionally passed after delivery at term, after miscarriage and in some cases of menorrhagia. For some reason the blood discharged from the endometrium clots in the cavity of the uterus to form a cast of the cavity and the cast is then extruded. Such cases are very unusual and the condition has no clinical importance.

CHAPTER XXII

RADIOLOGICAL TREATMENT IN GYNÆCOLOGY

IN recent years radiological methods have been extensively employed in the treatment of gynæcological diseases. Although the principles underlying the methods of treatment are simple, students and practitioners have been apt to regard radiological methods as being too technical for their comprehension. A simple description of the underlying principles may be of service.

RADIUM

Radium is an element of high atomic weight, which emits three emanations known as α , β , and γ rays.

The α emanations consist of particles, the α particles, which are the nuclei of helium atoms. Each atom of an element can be pictured as consisting of a nucleus, around which minute negatively charged particles or electrons rotate. The simplest atom is that of hydrogen, in which a single electron rotates around the nucleus. Next in order of atomic weight comes the helium atom, with two orbital electrons. An electron possesses the unit negative charge of electricity. Atoms are arranged in the Periodic Classification according to the number of orbital electrons they contain. The atom of helium with its two orbital electrons has no electric charge, the negative charge of the electrons being balanced by the positive charge of the nucleus. Each α particle consists of a helium atom deprived of both its orbital electrons and therefore has a positive charge of electricity.

The β emanations of radium consist solely of electrons with negative electric charge. The electrons are emanated with high speed.

The γ emanations are not particulate, like the α and β rays, but consist of radiations of high frequency and short wave length. Electro magnetic radiations all have the same velocity, the velocity of light, but they differ in their wave length. The product of the frequency and the wave length of the vibrations is always constant, and equal to the velocity of light. Radia-

tions of this kind are represented by wireless waves with long wave length, infra red rays, waves of the visible spectrum, ultra violet radiations, X rays, and γ rays, and this order groups the radiations according to their wave length. The wave lengths of the γ rays of radium are amongst the shortest known.

When radium is used therapeutically, the effect required is that of the γ rays. α particles and β particles produce local tissue injury. For this reason the radium emanations are filtered by screens of substances like platinum or iridium, which absorb the α and β particles, but are insufficient to stop the penetrating γ rays. The so called radium tubes which are placed in the uterus in the treatment of carcinoma of the cervix or to create an artificial menopause, consist of metal tubes of this kind which contain the radium that is employed in the treatment. The α and β particles, however, send off secondary rays from collision with the platinum screen and these secondary rays also produce tissue damage. To absorb these secondary radiations it is customary to surround the metal tube with a tube of rubber which is sufficient to absorb these non penetrating secondary radiations.

The metal radium is not used in its pure state, for its isolation is difficult, but compounds such as radium sulphate, which are easily prepared and which possess the same properties of radiation as the pure element, are used. The radium emanations are unaffected by chemical combination of the element. The dosage of radium is always referred to, however, in terms of weight of radium element present in the radium salt. For example, if it is stated that a tube contains 50 mgm of radium this means that the tube contains 50 mgm of radium combined with a sulphate radical in the form of radium sulphate, and the amount of radium sulphate present weighs considerably more than 50 mgm of radium.

X-RAYS

X rays consist of radiations similar to the γ radiations of radium, but of longer wave length. X-rays are produced by electric discharges in tubes containing rarefied gas. It is well known that an electric discharge in a tube exhausted of gas causes sparking, and when the gas pressure is extremely low electrons pass from the cathode and after impact upon the anode give rise to X rays. The wave length of the X-rays depends upon the speed with which the electrons from the

CHAPTER XXII

RADIOLOGICAL TREATMENT IN GYNÆCOLOGY

IN recent years radiological methods have been extensively employed in the treatment of gynæcological diseases. Although the principles underlying the methods of treatment are simple, students and practitioners have been apt to regard radiological methods as being too technical for their comprehension. A simple description of the underlying principles may be of service.

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cathode come into contact with the anode. The greater the voltage used the higher the speed of the electrons and the shorter the X rays produced by their impact upon the anode. In therapeutics the shorter the wave lengths of the λ rays, or, as it is termed, the harder the rays the greater is the effect produced. Such technical difficulties as obtaining a high voltage, finding a suitable anode to withstand the onslaught of high speed electrons, obtaining low gas pressure in the tube and heating the cathode so as to obtain an efficient supply of electrons belong to the province of pure physics. The X rays used in therapeutics are always filtered, for only the hard λ rays, that is to say, the rays with short wave length are of service. It is customary to filter the λ rays with filters of copper or zinc of about 0.5 to 1 mm. in thickness. The dosage of X rays is measured by physical means, either by a colorimetric method with a fluorescent screen, or by an ionisation effect. The standard dose for clinical work is referred to as the H.E.D. (Haut Einheits Dosis) the unit skin dose. This dose is defined as the dose of X rays required to produce reddening of the skin after twenty four hours followed by secondary inflammation after 8—10 days followed by bronzing after 3—4 weeks. Doses smaller than this are not followed by bronzing of the skin while larger doses produce burning with a formation of blebs and ulcers.

The Physical Basis of Radio-therapy

The effect of electro-magnetic radiations upon living tissues depends upon the wave length of the radiation. Radiations of short wave length have a more profound effect than softer rays. Ultra violet light causes bronzing of the skin but the effect of such radiations is restricted to the surface of the body, for the rays are of low penetrative power. Hard rays, such as X rays of short wave length and the γ rays of radium penetrate through opaque substances and the degree of penetration depends upon the hardness of the rays. Radiations of short wave length are therefore capable of affecting deep seated tissues.

The next point to be emphasised is that the harder the radiations the more profound their biological effect. Consequently the γ rays of radium with a wave length shorter than λ rays are more destructive of malignant tissue than λ rays.

When λ rays are used therapeutically the softer rays are filtered with screens of copper or zinc, so that only the hard

rays are used. Again, the harder the X-rays the more destructive will the action of the radiations be against malignant tissue. Modern machines are therefore designed to obtain high voltage, for the greater the voltage the harder the X-rays produced by the apparatus. With radium the effect produced on tissues varies inversely according to the distance of the tissues from the radium tube. The nearer the radium is placed to the growth, the more likely is the growth to be destroyed, for the γ rays are more concentrated in this vicinity than at a distance from the radium. This inverse square law illustrates one of the difficulties of radium treatment, for unless the radium is placed near the growth its effect is negligible. To overcome this difficulty so-called "bombs," containing relatively large doses of radium of the order of 4 or 5 gms., have been used in the treatment of some forms of carcinoma. The bomb can be used at a distance from the growth and its radiations focussed from different situations upon the area to be irradiated.

With X-rays the radiations are directed in the form of a beam of radiation from the source of the X-rays. If X-rays are used in the treatment of deep-seated malignant disease much of the radiation is absorbed by the intervening tissues. Again, only the unit skin dose of X-rays can be transmitted through any particular area of skin, for if larger doses are given an X-ray burn will be produced. To obtain the necessary concentration of X-rays successive doses must be transmitted through different areas of skin, but they must all be focussed upon the site of the growth to be attacked. In this way the cumulative effect of relatively ineffectual doses of X-rays concentrated upon a carcinoma of the cervix, for example, becomes sufficient to destroy the growth. This is the basis of deep X-rays therapy.

Biological Effect of X-rays and Radium

The body tissues have been shown to differ in sensitiveness to the influence of X-rays and radium. The clinical standard is the unit skin dose. The most sensitive tissues to X-rays and the γ rays of radium are those originating from the lymphatic system, so that the red blood cells, lymphatic cells, and lymphosarcomata are affected by relatively small doses of these radiations, whereas other tissues are only influenced by larger doses.

Next come the sex cells. The castration dose for the ovary is 34 per cent. unit skin dose, in other words, only a third of the

The cervix is pulled down with a volsellum forceps and dilated with Hegar's dilators. The uterus is curetted, and the curettings are subsequently examined to exclude carcinoma of the body or cervical canal. A tube of platinum of 1.5 mm thickness, containing 50 mgm of radium and surrounded by a tube of black rubber, is then introduced into the cavity of the uterus. A piece of string is tied around the rubber tube and the other end of the string attached to a piece of gauze, which is packed into the vagina. The tube is left *in situ* for forty eight hours, when it is easily withdrawn by removing the gauze plugging from the vagina. Sometimes patients suffer from vomiting and nausea while the radium is *in situ*, but abdominal pain arises only very rarely.

The local effect of radium upon the endometrium of the uterus is to produce necrosis and ulceration, so that most patients develop a vaginal discharge, which persists for about six weeks. During this time the vagina should be douched with mild antiseptic solutions. Sometimes as a result of the post menopausal involution induced by the radium treatment the vagina becomes susceptible to infection, so that a form of senile vaginitis with discharge develops. The condition responds well to treatment with douches. The effect of radium in creating an artificial menopause is not always immediate, and some patients may have one or two more periods before menstruation ceases. If a period develops shortly after the radium treatment, it is apt to be excessive, because of the radium endometritis, and it may be worse than any period the patient has had before. Consequently, patients should be warned of the risk of an excessive period and should be told to lie up while the period is in progress. Sometimes continuous bleeding ensues upon the radium treatment, but it is rare for such hæmorrhage to persist more than a few weeks. In women of menopausal age it is rare for another menstrual period to develop after the radium treatment. The end result of radium treatment for cases of this kind is excellent so far as the hæmorrhage is concerned, and all patients are free of hæmorrhage three months after treatment.

The operation for introducing a radium tube into the uterus is very simple. If the tube is small, anæsthesia is not always required, but if only a large tube is available there may be difficulty in dilating the cervix sufficiently to introduce the tube into the uterine cavity. The dosage mentioned above, 50 mgm for forty eight hours, is perhaps the most suitable for cases of

this kind. Larger quantities of radium may be introduced for a shorter time, but they tend to produce more local necrosis of the endometrium. The great advantage which the radium method has over X rays in the creation of an artificial menopause is that the uterus can be explored and by curetting and subsequent microscopical examination of the material removed, carcinoma can be excluded. The effect of the radium is almost certainly upon the ovaries, although Forsdike maintains that the action is uterine. It is, however, universally admitted that the rather similar radiations of X rays affect the ovaries, and histological examination of ovaries removed after radium treatment to create an artificial menopause shows atrophy of the ovaries, with a disappearance of primordial follicles, Graafian follicles, and corpora lutea. Again after radium treatment patients develop menopausal symptoms, which suggest that the effect of the radium is to induce inhibition of ovarian activity.

The Creation of an Artificial Menopause with X-rays In this method the X rays are applied over two areas anteriorly, one on each side of the symphysis pubis, and subsequently over either one or two areas posteriorly in the region of the sacrum. The rays are focussed upon the ovaries and the quantity of X rays used depends upon the type of case. In fat women larger doses are necessary to penetrate through the thickness of the parietes. If myomata are present it is again necessary to give larger doses. The filter and the tube distance depend upon the type of machine employed. In fat women with large myomata it may be necessary, in order to concentrate large doses upon the ovaries, to use additional ports of entry for the X rays. With modern machines the whole treatment can be carried out at one sitting although many radiologists prefer the dose to be spread out, for then the patient can be treated as an ambulatory case. Immediate symptoms, such as nausea, vomiting, headache and malaise, are unusual with the small dose necessary to create an artificial menopause.

The creation of an artificial menopause by radium or X rays is a valuable therapeutic measure in gynaecological practice. The primary mortality is negligible, and the immediate inconvenience to the patient is relatively small. The disadvantage of the treatment is that it creates menopausal symptoms which may be much more severe than those of a natural menopause. The menopausal symptoms are apt to be extremely severe in women under the age of 40, and from time to time such patients

develop an extreme degree of kraurosis of the vulva. In women over 45 the treatment is ideal for appropriate cases, and the types suitable for treatment have already been indicated in Chapter XV, where the contra indications to therapy of this kind have also been discussed. It is impossible to foretell, prior to radiological treatment, whether patients will develop severe after symptoms, but if such symptoms develop, they may cause so much distress as to inconvenience the patient more than the initial symptoms. As a general rule, it can be said that such symptoms rarely develop in women over 45, while they are relatively common if an artificial menopause has been created by radiological means in a woman under 40. In women under 40 it is preferable to treat by hysterectomy and to conserve the ovaries. With women between the ages of 40 and 45 there is a difference of opinion amongst individual surgeons as to the best method of treatment. Each case must be treated on its merits. If a woman is a good subject for operation it is better to perform hysterectomy and to leave the ovaries, whereas if the woman is a bad subject for operation then radiological measures should be employed.

Temporary Artificial Sterilisation On the Continent efforts have been made to create a temporary artificial menopause by radiological means. The method employs the use of X rays, for in skilled hands the dosage can be calculated very accurately, far more accurately than with radium. The method is theoretically ideal for cases of polymenorrhœa and menorrhagia in young women. Unless the correct dosage is applied much harm may be done, and with overdosage a permanent castration may be effected. It should be remembered, however, that if young women are treated with large doses of X rays or of radium they tend to return to normal menstruation several years afterwards, and it seems to be extremely difficult to guarantee a permanent artificial menopause if young women are treated even with very large doses of X rays and radium. The method of creating a temporary artificial menopause depends therefore upon the possession of modern machines and of a skilled radiologist.

There is another serious objection to the creation of a temporary artificial menopause by radiological means. It is well established that if a woman subsequently becomes pregnant, after having been treated radiologically in this way, there is a considerable chance of malformation of the foetus. The risk

of this complication is probably sufficient to deter a woman from embarking upon a subsequent pregnancy

Treatment of Carcinoma of the Cervix

Radium Methods Great progress has been made in recent years in the radium treatment of carcinoma of the cervix

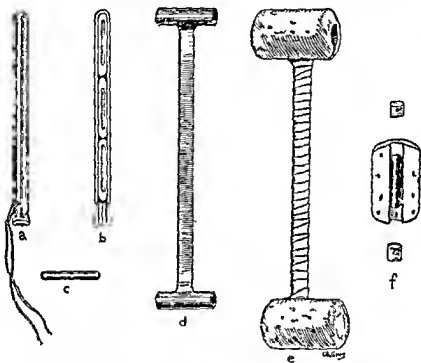


FIG. 209 The apparatus for Paris technique (a) rubber tube to contain (b) the metal tube inserted into the uterus in turn containing (c) radium tubes (d) the vaginal colpostat (e) vaginal colpostat prepared for application (f) the radium tube in position in the cork. (Lden and Lockyer)

Two main techniques have been established which are nowadays referred to as the Paris and the Stockholm methods

The "Paris Method" With this technique the radium is applied continuously for about eight days. In Paris the radium is introduced without preliminary anaesthesia. In this country the patient is anaesthetised and placed in the lithotomy position. The cervix is exposed with vaginal retractors dilated and a piece of the growth removed for section. Radium is now

applied in the vault of the vagina. The radium is contained in platinum tubes of 1.5 mm. thickness, and the platinum tubes are themselves enclosed in hollow corks 5 mm. thick. Thin black rubber sheeting is wound around the corks. Two of the corks are attached together by a strip of whalebone, which acts as a spring. These corks are placed in the lateral fornices,

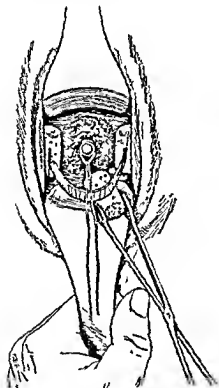


FIG. 210. Treatment of carcinoma of the cervix by the Paris technique. Second application. The tube of radium is placed in the cavity of the uterus. The corks are placed in the lateral fornices while a third cork is introduced to lie directly against the cervix. (Eden and Lockyer)

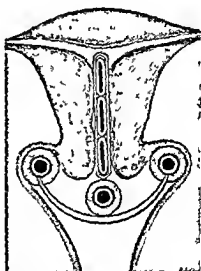


FIG. 211. Paris technique for the treatment of carcinoma of the cervix with radium.

while a third cork containing a radium tube is placed directly against the growth in the cervix, and all three corks kept in position by gauze plugging. The two corks placed in the lateral vaginal fornices each contain 13.3 mgm. radium element, while the cork placed directly against the carcinoma contains 6.6 mgm. The object of the cork filter is not merely to filter secondary rays but to protect the vaginal walls from the effect of the radium

In the most recent technique the vaginal applicators are kept *in situ* for three days, when they are removed and cleaned, and the vagina is irrigated. A long tube of radium containing 33.3 mgm of radium element filtered by 1.5 mm of platinum is then placed in the cervical canal, the long tube extending upwards to the region of the fundus of the uterus. The vaginal applicators are now reintroduced and kept *in situ* for four days, when the whole of the radium is removed. The total radium dosage is therefore of the order of 8,000 mgm hours. Lacassagne emphasises the risk of acute sepsis following upon the radium treatment of carcinoma of the cervix, and it is customary for the growth to be examined bacteriologically for the presence of hæmolytic streptococci before the treatment.

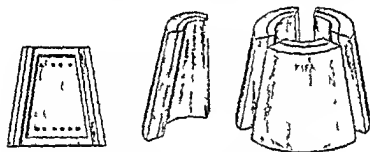


FIG. 212. Stockholm technique. Cone applicator for coal flower growths of the cervix (E. Len and Lockyer.)

is begun. Again, in Paris, the cervix is dilated on the day before the treatment, and if there is no rise of temperature as the result of this procedure, the radium treatment is started. If pyrexia develops, the application of the radium is delayed. The advantage of the Paris technique is that treatment is continuous, and only one stay in hospital is necessary.

The "Stockholm" Method. This technique, perfected by Forsell and Heymann, is rather different because three separate applications are made. The total dosage is smaller, varying between 6,000 and 7,000 mgm hours. In Stockholm an anæsthetic is not given as a routine, morphia being administered hypodermically before the radium is introduced. In the first application, about 80 mgm of element are used in the vaginal applicators and 40 mgm in the uterine tube. The radium is kept *in situ* for about twenty hours. The interval between the

first and second applications is about eight days, and between the second and third, the interval is about three weeks. The

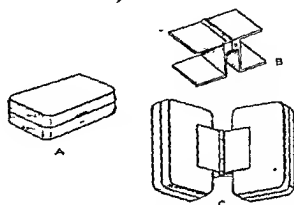


FIG. 213. Stockholm technique (A) Flat blocks to contain radium needles (B) Clip fastener (C) Boxes articulated by means of clip fastener (after Hamon) (Eden and Lockyer.)

filter is relatively heavy, corresponding to 3 mm. of lead or 1.5 mm. of platinum. The next great characteristic of the

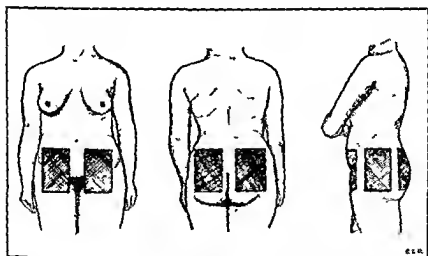


FIG. 214. The distribution of the skin areas irradiated in the X-rays treatment of carcinoma of the cervix. (After Stoeckel)

Stockholm technique is the variety of the vaginal containers. A large series of boxes, cylinders, cones, etc., of different shapes and sizes, are available. The exact form of container to be

used for the vaginal application depends upon the local conditions found, for it is clear that different containers are necessary with exophytic and endophytic tumours, and with large vaginas and with small vaginas. Heymann stresses the danger of injury to the rectum and protects the vaginal walls from the action of the radium by careful packing and by surrounding the applicators with wool and silk.

The results of treatment of carcinoma of the cervix by vaginal applications of radium are extremely good, compared with those obtained in the treatment of carcinoma elsewhere in the body. Theoretically, however, it seems unlikely that metastatic carcinoma far out in the parametria or in the lymphatic glands can be influenced by the γ rays. There is some clinical evidence that such metastases are affected in some way or other, but it seems clear that future methods of radiotherapy will include measures designed to attack the metastatic carcinoma. At the present day it is customary in most clinics to give a subsequent dose of X rays to the pelvis in an attempt to kill the carcinoma cells which spread far from the primary growth.

Efforts have been made to deal with the metastatic carcinoma by introducing tubes of radium directly against the affected glands by abdominal operation. Such procedures are followed by severe peritoneal reaction and the method is now being replaced by the use of deep X rays therapy.

In France radium bombs have been used in the treatment of carcinoma of the cervix. About 4 gm of radium is used as a source of the radiations, using a filter equivalent to about 1 cm of platinum. The γ rays are focussed in a manner rather similar to X rays. The method of treatment is in its infancy, and there are many technical difficulties which have to be overcome.

The X-rays Treatment of Carcinoma of the Cervix

X rays treatment of carcinoma of the cervix has been particularly developed in Germany, where the supply of radium was much reduced after the War. In the Erlangen technique six fields, each 6×8 cm, are irradiated by the so called concentration method. The skin areas are situated anteriorly, posteriorly, and laterally. The rays are focussed on the cervix of the uterus so that the total accumulative dose reaching the carcinoma cells is of the order of 110 per cent of the unit skin dose. Eight or nine weeks later the patients return when both parametria are

irradiated. Recent improvements have consisted in increasing the size of the areas irradiated and applying a further dose over the vulva directed towards the cervix. The voltages, the tube distance, and the filtration depend upon the machines available for the therapy. In Munich, in addition to deep X-rays therapy,

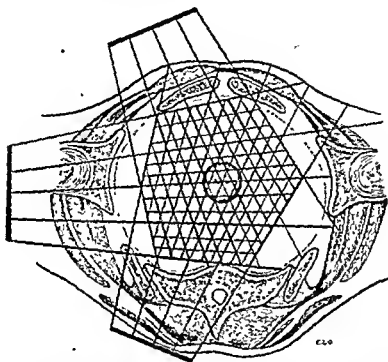


FIG. 215. Irradiation of the pelvis with X-rays for carcinoma of the cervix. The illustration shows how the cross-fire radiation concentrates the dose in the region of the cervix. (After Stoeckel)

X-rays are applied to the pituitary gland and radium is used locally in the cervix.

The results of X-rays treatment of carcinoma of the cervix are good with modern machines, but the technical difficulties are very great indeed, and many years must be spent in perfecting the technique. The modern tendency is to use radium locally and subsequently to irradiate the pelvis with deep X-rays.

The Dangers of Radiotherapy

Although radiotherapy in the treatment of carcinoma of the cervix has an initial mortality far less than operative measures, it is wrong to suppose that the treatment is free of danger. The

primary mortality of radium treatment is about 2 per cent, and most fatal cases have been caused by acute sepsis. If grossly septic growths are irradiated with large doses of radium a fatal septicæmia may be lighted up immediately. In other cases extensive pelvic cellulitis with suppuration and pyæmia may develop. Preliminary treatment is, therefore, of first importance with septic growths of this kind. The vagina should be douched with antiseptic solutions and the growth itself painted with strong antiseptics. Most authorities claim that acetone is very useful in cleaning up infected growths. Another difficulty is that a pyometra may have developed above the level of the cervical growth, and it is for this reason that in Paris the cervix is dilated before the radium treatment is attempted. Again, it is found that if small doses of radium are given to septic growths the chances of the development of a fatal septicæmia are much less than when massive doses are employed.

Apart from the incidence of sepsis and the primary mortality, there is a very high incidence of post radiation morbidity. The most frequent complication is the development of a radium proctitis due to over dosage, so that the anterior wall of the rectum ulcerates and causes appallingly severe pain with tenesmus. Moreover, after the completion of healing some degree of stenosis of the rectum may be produced. Much care must, therefore, be taken to avoid over dosage, and this is particularly so if deep X rays are being used after the vaginal application of radium. With both the Paris and Stockholm techniques the containers must be kept well away from the rectum by packing.

It is rare for the bladder to be affected by the radiation therapy, and if urinary symptoms develop after irradiation therapy they are much more likely to be caused by infiltration with growth than by ulceration due to over dosage.

After the vaginal application of radium for carcinoma of the cervix the upper part of the vagina becomes occluded by the contraction of scar tissue in the wall, and it is not uncommon for the upper part of the vagina to be completely stenosed. Again, after over dosage, patients may experience pain referred along the sciatic nerves, probably due to a neuritis of the nerves of the sacral plexus. Another complication which is seen from time to time is a curious metastasis of carcinoma by way of the blood stream, so that secondary deposits form in the bones and may be disseminated widely through the body.

The symptoms which arise during the course of treatment, such as vomiting, headache and malaise, are not so frequent as in previous years

Results of Radiation Therapy

It is difficult at the present time to assess the significance of the figures obtained by radiation therapy in the treatment of carcinoma of the cervix. In Paris, Lacassagne records a total curability rate of 26 per cent, while the Stockholm results give a five year survival rate of about the same order

CARCINOMA OF THE BODY OF THE UTERUS

Most gynaecologists prefer to treat carcinoma of the body of the uterus by total hysterectomy rather than with radium. The surgical results are extremely good, and if the patient is a fit subject for operation surgical treatment is usually advised. On the other hand in Stockholm, Munich, and, more particularly, at the Marie Curie Hospital in London, good results have been recorded. At the Marie Curie Hospital, Hurdon and Chambers adopt a technique similar to the Stockholm treatment for carcinoma of the cervix. The radium is applied in three applications at one and two weeks intervals. Recent work has suggested that better results are obtained if preliminary radium treatment is followed by deep X rays therapy.

Carcinoma of the Vagina

Carcinoma of the vagina is a rare tumour, but clinical experience shows that it is particularly radiosensitive. The carcinoma can be treated quite simply with radium needles which surround the growth and also penetrate into its substance. The exact dosage depends upon the size of the tumour, but good results have been obtained with doses of 50 mgm of radium for five days. Particular care must clearly be taken to avoid over dosage, for if the tumour is near either the bladder or rectum, fistula is almost certain to develop.

Carcinoma of the Vulva

Carcinoma of the vulva is treated from time to time with radium and with X rays. The radium treatment consists in the use of needles and the best results seem to follow the use of small doses over a long period of time. Other authorities

prefer to use either applicators or radium plaques. The glands can be treated with radium needles or by X rays.

The results of treatment of carcinoma of the vulva are almost uniformly bad. Opinions differ as to the reason for the poor prognosis. It seems, however, that suppuration in the inguinal glands and later in the external iliac glands is the real cause of the unfavourable course of the disease. Probably equally good results as those with radium follow upon simple excision of the vulva. Local excision of the carcinoma gives bad results unless the vulva is subsequently treated with X rays. So far as the glandular metastases are concerned it is probable that the best results are obtained from the use of deep X rays. In all cases of carcinoma of the vulva every effort should be made to prevent suppuration in the inguinal and iliac glands.

Chorion Epithelioma

In recent years cases of chorion epithelioma have been treated with radium and deep X rays. There is reason to believe that the growth is radiosensitive. With modern methods of investigation chorion epithelioma should be diagnosed in the very earliest stages and most gynæcologists would prefer to treat the case by hysterectomy rather than by employing radiological means. With advanced growths and with metastases radiological methods are clearly indicated.

Sarcoma of the Uterus

It has already been pointed out that most cases of sarcoma of the uterus are diagnosed after the uterus has been removed. It is customary to treat such cases with X rays subsequent to operation. It is only rarely that the condition is diagnosed prior to operation. Most gynæcologists would prefer to treat by operation if the patient were a good subject. The growth is usually very radiosensitive and radiological treatment should be employed to deal with any metastases that may develop. In elderly women and patients who are bad subjects for operation, radiological treatment would be employed in preference to surgery.

Malignant Tumours of the Ovary

The prognosis with malignant ovarian tumours is bad. Few cases survive more than five years after the onset of symptoms, whatever method of treatment is employed. The best results

follow upon the surgical removal of the uterus, both ovaries and both Fallopian tubes, combined with subsequent X-rays therapy. X-rays treatment to inoperable growths is sometimes of benefit, but if the malignant tumours attain a large size much cannot be expected from any form of treatment. Moreover, the immediate symptoms of vomiting and malaise are frequently very severe if large malignant ovarian tumours are irradiated. As with most forms of carcinoma the best results are obtained in the treatment of early cases. From time to time patients are seen who are much improved by X-rays treatment subsequent to removal of the primary growths and the uterus by operation.

Pruritus of the Vulva

The indications for using X-rays and radium plaques in the treatment of pruritus of the vulva have already been described in Chapter VII., p. 100, where the dosages have been indicated. Similar doses are used in the treatment of leukoplakia of the vulva and kraurosis.

CHAPTER XXIII

ADENOMYOMATA, ADENOMYOSIS, CHOCOLATE CYSTS OF THE OVARY

A GREAT deal of attention has been paid in recent years to the curious proliferations found in the pelvis which are best exemplified by adenomyomata of the uterus and chocolate cysts of the ovaries. Such proliferations are difficult to classify pathologically, for they should not be regarded as neoplasms although they possess the remarkable property of infiltrating adjacent structures. They do not, however, give rise to secondary deposits and it is very doubtful if they ever undergo malignant change. The swellings consist in the main of heterotopic endometrial proliferations, although this definition must be accepted in its broadest sense for chocolate cysts of the ovaries. The proliferations are almost certainly produced by hormonal influences which lead to atypical development not only of the epithelium of the Mullerian system but also of the peritoneal mesothelium and the epithelium derived from the caudal part of the primitive coelomic mesothelium.

The modern view of the proliferations assumes that their development is inter related, so that coincident proliferations are found in the uterus in the ovaries and over the pelvic peritoneum. The condition is found very frequently in gynaecological practice and is responsible for the symptoms complained of by a fair proportion of gynaecological patients. At the present day the clinical picture of cases of chocolate cysts of the ovaries, of pelvic endometriosis and adenomyosis of the uterus is familiar to all gynaecologists. The pathology of the condition is not completely understood and the present day position has been established by investigations of each particular form of proliferation in turn. It has not been until recently that all forms of proliferations of this kind have been grouped together.

Historical

Adenomyomata of the uterus were first recognised by Rokitansky. He regarded them as tumours which were usually

found near the cornua. They consist of normal myometrium in which gland spaces are found. The glands are similar to those of the endometrium and are surrounded by a cellular stroma similar to that of the endometrium. Although the tumours do not produce specific symptoms which would make the cases of especial clinical interest, their pathology immediately attracted attention, for the tumours were obviously different from the usual form of neoplasm. At a later date, Chiari described the condition salpingitis isthmica nodosa, in which nodular areas are found in the isthmus portion of the Fallopian tube. Chiari demonstrated that the majority of cases followed upon tuberculous salpingitis and showed that the nodular appearance was caused by a downgrowth of epithelium from the mucous membrane of the Fallopian tube which gave rise to a localised hyperplasia of the muscle wall. In 1893 Von Recklinghausen made a detailed survey of adenomyomata of the uterus and suggested that the cornual position, and perhaps the microscopical appearances as well, could be explained by postulating that the tumours arise from embryonic rests of the Wolffian system. This suggestion has been shown to be erroneous for the Wolffian system never lies in proximity to this part of the Müllerian duct at any stage of development. Von Recklinghausen showed, however, that some centrally located adenomyomata of the uterus arise by downgrowth from the uterine mucosa. In 1893 Cullen in a most comprehensive survey of pelvic adenomyomata demonstrated that most forms are produced by downgrowth of the endometrium of the uterus into the myometrium. Cullen collected together a fairly large series of cases which illustrated the extent to which these proliferations may develop. The proliferations may extend backwards into the recto-vaginal septum and involve the rectum and sigmoid, fixing the bowel and in some cases producing rectal symptoms and even stenosis. Similar tumours were subsequently described in other parts of the pelvis. They are not uncommon in the round ligament and in the ovarian ligament, and have been found arising from the round ligament in the inguinal canal and in the labium majus.

The pathology was further complicated when it was shown by Iwanoff that some forms of adenomyomata of the uterus arise as the result of metaplasia of the peritoneal covering of the uterus which led to downgrowths assuming the form of endometrial glands. It seems to be definitely established that two

forms of adenomyomata of the uterus can be demonstrated, one in which the gland spaces are derived from downgrowths of the uterine mucosa, the other in which they originate from downgrowths of the peritoneal mesothelium. Moreover, as the tumours should not be regarded as neoplasms, it is perhaps best to use the nomenclature "adenomyosis interna" and "adenomyosis externa" for the two types of case. In 1921 Sampson, in America, called attention to the well known chocolate cysts of the ovary and showed that such cysts were lined by epithelium which closely resembled that of the endometrium. About the same time it was shown that the small nodules found over the pelvic peritoneum and the vascular adhesions which are so often present in these cases, contain similar gland spaces if they are examined microscopically. Sampson suggested that chocolate cysts of the ovaries and pelvic endometriosis were caused by implantation of endometrium regurgitated through the Fallopian tube during normal menstruation.

Attention was then directed upon other forms of related proliferations. Adenomyomata of the umbilicus had been recognised for some time, but it now became clear that the incidence of proliferations of the pelvic endometriosis type was more widespread than had previously been believed. Similar proliferations were found in hernial sacs, in the utero vesical pouch, over the pelvic peritoneum, on the posterior vaginal wall, and on occasion at the vulva.

Ætiology

Sampson and his followers maintain that implantation of regurgitated endometrium explains the majority of cases of chocolate cysts of the ovary and of pelvic endometriosis. Sampson has presented a formidable mass of evidence in support of this theory. He has shown that substances injected into the cavity of the uterus permeate along the Fallopian tubes and can be demonstrated at a later date over the pelvic peritoneum. It is also well known that menstrual blood is often found in the pelvis during normal menstruation, and Halban has found endometrial tissue in this fluid. Similarly, grafting experiments have shown that the endometrium can be implanted on to the peritoneum, and during pregnancy a decidual reaction comparable to that found in the endometrium has been demonstrated in the stroma of these heterotopic endometrial

proliferations. Again, secretory hypertrophy can usually be demonstrated in the affected areas during the menstrual cycle, and it is more than probable that some degree of menstrual bleeding occurs from them during menstruation itself. In other words, the heterotopic proliferations are influenced by the normal hormonal control of the menstrual functions. It is definitely established that menstrual regurgitation is a fairly frequent phenomenon, so that there is much evidence in support of Sampson's theory. The so called adenomyomata in laparotomy scars after pelvic operations, such as Cæsarian section, can most satisfactorily be explained by assuming that pieces of endometrium become implanted in the wound during the operation.

The Serosal Theory. The serosal theory, which has been elaborated particularly by Robert Meyer, explains all forms of adenomyosis, chocolate cysts of the ovaries, and pelvic endometriosis, as due to metaplasia of the peritoneal mesothelium. It is well known that the peritoneal mesothelium frequently undergoes metaplasia and becomes converted into high columnar epithelium, particularly in inflammatory lesions in the pelvis and even with ectopic gestations. The epithelium of the Müllerian system is primarily derived from the primitive mesothelium of the coelome. The serosal theory therefore postulates that adenomyosis interna of the uterus is due to proliferation of this epithelium and that chocolate cysts of the ovaries and pelvic endometriosis are caused by a similar conversion of the surface epithelium of the ovaries and peritoneal mesothelium. The serosal theory in this way accounts for all forms of adenomyosis and endometriosis, even the rare tumours of the umbilicus, endometriosis in hernial sacs, and even of laparotomy scars when it is assumed that the peritoneal mesothelium grows into the scar tissue. It is difficult to produce conclusive evidence in support of either theory, but histological investigations definitely favour the serosal theory. One of the main objections to the theory of implantation is that if the theory is true all women with regurgitant menstruation should have pelvic endometriosis, and this is certainly not the case. Again, the theory does not explain adenomyosis interna of the uterus or adenomyoma of the umbilicus. The histological appearances of chocolate cysts of the ovary do not support the theory of implantation but definitely favour the view that the tumours arise as a result of downgrowth of the surface epithelium.

The modern view of the *aetiology* of the proliferations is that they are all caused by some abnormal hormonal influence. It cannot be a coincidence that the distribution of chocolate cysts and pelvic endometriosis is the same as that of ectopic decidual cells during pregnancy, but whereas in pregnancy the decidual reaction involves the stroma cells, in endometriosis and allied conditions the adjacent mesothelium and epithelium are involved. There is, of course, no exact knowledge of the

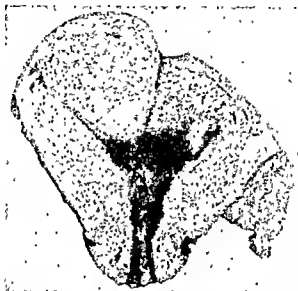


FIG. 216. Adenomyosis of the uterus. To the left and above the thick wall of the uterus can be seen showing the typical appearance of adenomyosis.

hormonal factors. In this connection the section on the chemistry of the sex hormones should be referred to. It is suggested that the abnormal hormonal influence is of such a nature that substances slightly different in their chemical constitution from the natural ovarian hormones are secreted by the ovaries and lead to the production of heterotopic endometrium. In the view of the author endometrial implantation is of small importance in the production of the lesions which are encountered. The majority of patients with these proliferations are single women or women without children.

Morbid Anatomy and Histology

Adenomyosis of the Uterus Most examples of adenomyosis of the uterus take the form of adenomyosis interna, when it is possible to trace downgrowths from the endometrium into the myometrium. Some degree of adenomyosis is always found with metropathia hæmorrhagica. With well marked adenomyosis of the uterus the uterus is asymmetrically enlarged, usually in the direction of one or other cornu. The affected area is softer in consistence than an intramural myoma and

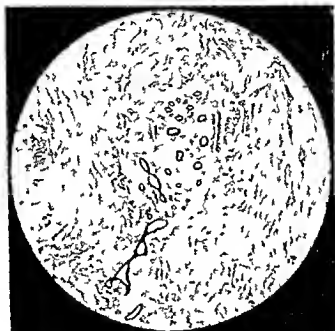


FIG. 217 Adenomyoma of the uterus

when mixed has a peculiar striated appearance with very grey soft areas interspersed amongst the striations. Adenomyosis is never encapsulated as is a myoma, and the affected area merges into normal myometrium. Occasionally small collections of blood can be distinguished which are found on microscopical examination to consist of gland spaces filled with blood. Microscopical examination of uterine adenomyosis shows the presence of gland spaces similar to those of the glands of the endometrium surrounded by cellular stroma, again similar to the stroma of the endometrium, while around this cellular stroma lies normal

myometrium. The gland spaces do not usually show secretory hypertrophy during the menstrual cycle although this alteration can sometimes be detected. The stroma cells, however, undergo marked decidual reaction during pregnancy. When the adenomyosis area arises low down in the uterus it may spread backwards along the utero sacral ligaments and involve the sigmoid and rectum, when the bowel wall becomes thickened and fibrosed. A similar involvement of the bowel arises with endometriosis of the peritoneum of Douglas's pouch.

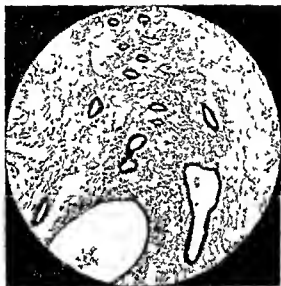


FIG. 218. Adenomyoma of the uterus. The glandular tissue is surrounded by a stroma similar to that of the endometrium while on either side lies normal myometrium. Some of the gland spaces are cystic the one below and to the left containing large degenerate cells.

Adenomyosis externa is much less frequent than adenomyosis interna but the histological appearances in the middle of the affected area are identical and there is no difference in the characters of the gland spaces and stroma which lie deep in the myometrium.

Adenomyoma of the Round Ligaments. Adenomyoma of the round ligaments arises most frequently in the inguinal canal and occasionally the swellings develop in the labium majus. Tumours as large as 2 in in diameter have been described. These tumours contain plain muscle and should be regarded

as of similar type to adenomyosis of the uterus. Areas of endometriosis are sometimes found in hernial sacs both in the inguinal and femoral canals, when a tender swelling is produced at the extremity of the sac which usually swells and causes local pain during menstruation. The swelling consists mainly of

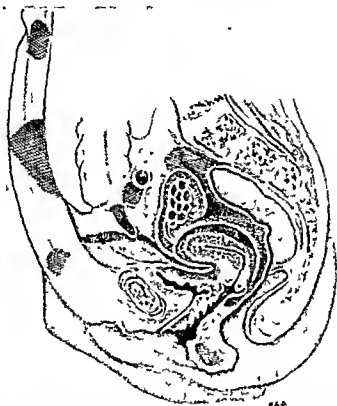


FIG. 219. The distribution of pelvic endometriosis. The types illustrated are those of the umbilicus, laparotomy scars, round ligament, appendix and small intestine. Adenomyosis interna of the Fallopian tube and uterus are shown with a different shading. Adenomyosis externa of the uterus and Douglas's pouch, the sigmoid, the recto-vaginal septum and the ovary are also shown. Lastly, the rare form of the perineal endometrioma is illustrated. (After Halban-Seitz.)

dark altered blood with vascular adhesions, and an microscopical examination is found to contain glands similar to those of the endometrium.

Adenomyoma of the Recto-Vaginal Septum. In this type of case the proliferation may spread downwards along the recto-vaginal septum and backwards to infiltrate the wall of the rectum and cause rectal symptoms and even stenosis. Various types

of development a hæmatoma develops beneath the surface epithelium of the ovary, which subsequently becomes represented by an area containing connective tissue cells engorged with blood pigment and with a few pseudo-lutein cells. In the next stage the surface epithelium of the ovary invaginates itself into the depths of this area, becoming endothelial-like in the process. At this stage the small chocolate cyst has a thick wall of pseudo-lutein cells, while the cavity of the cyst is small compared with the thickness of the wall. Later in the develop-



FIG. 223. The wall of an old-standing chocolate cyst. The lining epithelium is high columnar, beneath which a stroma has been differentiated. Small papillomatous processes have been formed and project into the cavity of the cyst.

ment of the cyst the pseudo-lutein cells become reduced in number, while simultaneously the endothelial lining becomes columnar in type. Sections of the chocolate cysts of the ovary frequently show that minute pieces of tissue rather similar to the endometrium are attached to the surface of the ovary and such appearances clearly suggest that these areas of endometrium may give rise, by infiltrating the ovary, to cysts lined by endometrium. The supporters of the serosal theory maintain that there is no reason to believe that normal endometrium ever infiltrates normal tissues, and that such a hypo-

thesis does not explain the histological appearances of small chocolate cysts. Nevertheless, it is well established that tissue indistinguishable from the endometrium is sometimes found in the lining of chocolate cysts. The upholders of the serosal theory maintain that this tissue is produced by metaplasia of the lining epithelium of the chocolate cyst, just as the areas of pelvic endometriosis are formed by metaplasia of the cells of the peritoneal mesothelium. The fluid blood contained by chocolate cysts is partly derived from hæmorrhage from the vascular wall and partly, though less frequently, by menstrual hæmorrhage from areas of endometrium like tissue which, as already mentioned, are sometimes found in the walls of the cyst.

Salpingitis Isthmica Nodosa This condition described by Chiari is less frequent than in previous years. It takes the form of localised nodules in the isthmus region of the Fallopian tube, which on microscopical examination are somewhat similar to uterine adenomyosis. It is well established that most cases follow upon tuberculous salpingitis and the condition is produced by downgrowths from the mucous lining of the Fallopian tube into the muscle wall which undergoes hyperplasia.

Symptomatology

Adenomyosis of the Uterus The exact diagnosis of adenomyosis of the uterus is difficult. The maximum age incidence of the disease is between the ages of thirty and forty. Most of the patients are either sterile or have had only one or two children many years before. The main complaint is excessive menstrual loss combined with severe dysmenorrhœa. If a woman of the type mentioned above develops severe dysmenorrhœa between the age of thirty and forty, adenomyosis of the uterus should always be suspected. Dyspareunia, backache, and pain in the rectum are also common symptoms. On physical examination the uterus is found to be enlarged, perhaps asymmetrically, and characteristically is softer than a uterus containing an intramural myoma. There may be difficulty in interpreting the physical signs because the condition is sometimes associated with the presence of uterine myomata and with chocolate cysts of the ovaries.

Chocolate Cysts With chocolate cysts the maximum age incidence is between the ages of thirty and thirty five and

most cases develop in the decade between thirty and forty. About a third of cases arise in single women. Of the married women with the disease about a third of patients are sterile, and it is rare for women who have borne large families to develop chocolate cysts of the ovaries. Chocolate cysts are not associated with irregularities of the menstrual rhythm, but menorrhagia is not uncommon, although it should not be regarded as one of the most striking symptoms of these cases. The most characteristic symptom is abdominal pain, situated either in the lower abdomen or back. The pain is on occasion of great severity, but a dull ache is the usual complaint. The pain develops both before, during and after menstruation. The pain should not be regarded as a form of dysmenorrhœa and most patients when questioned carefully will state that it is different in type from dysmenorrhœa. In some cases the cyst ruptures during menstruation and causes violent abdominal pain which necessitates laparotomy. Torsion of chocolate cysts is extremely rare because of the adhesions to surrounding structures. In the typical case therefore, the patient is between the age of thirty and forty, and is either sterile or has been pregnant only a few times. The main symptom is abdominal or sacral pain, which is definitely related to menstruation although not characteristically premenstrual. Menorrhagia and dyspareunia may be complained of, and if the bowel has been infiltrated rectal symptoms may also be present.

The physical signs are those of a cystic thick walled tumour found behind the uterus above the utero sacral ligament, which is slightly tender and fixed. Hard nodules due to pelvic endometriosis are usually found in Douglas's pouch. If the condition is bilateral similar physical signs may be found in the region of the other appendages.

The diagnosis can be made without difficulty in virgins and when pelvic inflammation can be excluded. Salpingo-oophoritis and tubovarian cysts may be associated with almost similar histories and physical signs.

With adenomyomata of the rectovaginal septum, the condition must be differentiated from carcinoma of the bowel, secondary deposits in Douglas's pouch, and tuberculous peritonitis. Adenomyoma of the round ligament usually becomes painful during menstruation and such a history would lead to the diagnosis being made.

Treatment

With adenomyosis of the uterus treatment consists in hysterectomy, for most patients are under the age of forty

With chocolate cysts treatment is surgical. If the condition is unilateral the affected ovary and Fallopian tube should be removed. The drawback to this relatively conservative treatment is that a similar condition may develop in the opposite ovary at a later date, or coincident pelvic endometriosis may also produce symptoms. Again, concurrent adenomyosis of the uterus may lead to menorrhagia and dysmenorrhea. The end results of the removal of a chocolate cyst are therefore not always satisfactory. On the other hand, the removal of both ovaries, together with the uterus is a method of treatment far too drastic to be advocated in a woman younger than forty. If both ovaries are affected by chocolate cysts, the two ovaries must be removed and if there is pelvic endometriosis or adenomyosis of the uterus, a hysterectomy has to be performed. With chocolate cysts arising in women over the age of forty it may be considered advisable to perform pan hysterectomy if there is evidence of pelvic endometriosis or adenomyosis of the uterus. Again, if the opposite ovary subsequently develops a chocolate cyst after a chocolate cyst has been removed from one side then clearly the remaining ovary must be removed. It is only rarely that chocolate cysts can be resected so that healthy ovarian tissue is left behind. It is important to remember that chocolate cysts, pelvic endometriosis and uterine adenomyosis all retrogress after the creation of an artificial menopause by radiological means. Similar remarks apply to the extensive adenomyomata of the rectovaginal septum and for adenomyosis of the sigmoid colon. In past years it was customary to perform extensive operations which entailed the removal not only of the uterus but of the lower bowel for advanced cases of this sort. Nowa days, the condition retrogresses after the creation of an artificial menopause by radiological means.

It is also well established that pelvic endometriosis and allied conditions tend to retrogress during and after pregnancy. If therefore, a woman under forty is operated upon for unilateral chocolate cyst of the ovary she should be informed that the chances of the development of a similar condition elsewhere in the pelvis are small if she subsequently becomes pregnant. The main

problem in the treatment of chocolate cysts and endometriosis is to prevent the subsequent involvement of some other structure. Pregnancy is the most certain method of hindering the development of heterotopic endometrial proliferations.

With local forms such as adenomyoma of the umbilicus, endometriosis in incisional scars, adenomyoma of the inguinal canal, and adenomyoma of the vulva, local excision is all that is necessary.

CHAPTER XXIV

DISEASES OF THE OVARIES

INTRODUCTION

THE majority of ovarian tumours take the form of cysts, and three types of cyst are recognised. The first is a retention cyst of the Graafian follicle, but as the cyst may arise at any stage of development of the follicle, it may take the form either of a follicular cyst, or of a corpus luteum cyst. In the second type the cyst develops as the result of past inflammation of the uterine adnexa, so that a distended Fallopian tube communicates with a follicular cyst of the ovary to form a tubo-ovarian cyst. In the third type the cyst is a neoplasm.

It is important to distinguish between a retention cyst and a neoplasm which assumes the form of a cyst. The simplest type of the latter is a cystoma, a unilocular cystic swelling lined by active epithelium, either cubical or columnar, which shows a tendency to proliferation and the formation of intra-cystic growths. Quite frequently the neoplasm has the structure of a multitude of cystomata which are matted together. A tumour of this kind is called a cystadenoma. It is best exemplified in the ovary by the pseudo mucinous cystadenoma, the common multilocular ovarian cyst. On the other hand, a retention cyst is lined by flattened epithelium and its origin is from some pre-existing structure.

In the present chapter the retention cysts and the neoplasms of the ovaries will be described. Inflammatory lesions of the ovary will be considered in Chapter XXV, while the chocolate cysts of the ovaries, which are different from either retention cysts or new growths, have been linked with adenomyomata and allied conditions in the previous chapter.

Cysts of the Follicle System

Ripening and atresia of follicles, together with proliferation and retrogression of the corpus luteum are normal physiological processes. A Graafian follicle or a corpus luteum may become

cystic through overactivity, and such cysts are not necessarily pathological. Indeed, it may be difficult to decide whether or not a cyst of this kind should be regarded as pathological, and one of the greatest difficulties in gynaecological surgery is to decide at operation whether an enlarged and cystic ovary contains physiological or pathological cysts.

Follicular Cysts

Follicular cysts arise either from ripening or atretic follicles. They should be regarded as pathological if they are more than an inch in diameter, or if the ovary is studded with a series of small cysts of this kind. Follicular cysts are lined by granulosa and theca interna cells, but the granulosa cells always show signs of retrogression although hypertrophied theca interna cells often persist at the periphery. Follicular cysts are thin walled and contain translucent colourless fluid. Different forms of follicular cysts are recognised. In the first called *Hydrops folliculi*, a single large follicular cyst is present in the ovary. This condition is very unusual, and must be distinguished from a *cystoma simplex*, which has a very similar appearance and is a new growth. The distinction is only possible by histological examination.

If the ovary and tube are matted together by adhesions as the result of previous adnexal inflammation the ovary frequently contains several large cysts. Again, follicular cysts are not uncommon in the large hyperplastic ovaries of cases of myomata.

A rather similar type of cyst is invariably present in *metropathia hæmorrhagica* (p. 345) although the cyst associated with this condition retains some at least of its granulosa cells in a state of activity, and indeed the granulosa cells may show some degree of luteinisation.

Sclero-cystic Disease

In sclero-cystic disease the ovary is symmetrically enlarged with a thickened white tunica albuginea and its cortex is riddled with small follicular cysts of about $\frac{1}{4}$ in. to $\frac{1}{2}$ in. in diameter. Well marked sclero-cystic disease is infrequent. As many as thirty small cysts may be found in the same ovary. The peritoneal surface of the ovary is free of adhesions without evidence of previous inflammation of the adnexa. Normal corpora lutea are formed, although they tend to be hyperplastic.

The disease usually arises in young women, although ovaries of this kind are sometimes found associated with myomata in patients of about the age of 40. There is some evidence that the disease develops only rarely in women who have borne children. The disease is probably caused by ovarian dysfunction, perhaps a form of hyperplasia involving the follicle system. A somewhat similar condition is found in nymphomaniac mares. As with all forms of ovarian dysfunction it is possible that the ovarian changes are secondary to pituitary disturbances.

Patients with sclero cystic ovaries suffer from severe pain during menstruation, but the pain is abdominal and ovarian, and different from the usual type of dysmenorrhœa. Dyspareunia is another common symptom and severe pain is also experienced as the result of hæmorrhages into the follicles. The treatment of sclero cystic disease is unsatisfactory. The old operation of excising wedges from the cortex gives bad results, and in any case the basis for this form of treatment is unsound. If the ovaries are prolapsed into Douglas's pouch, and cause dyspareunia, it may be necessary to perform a ventrisuspension operation and to shorten the ovarian ligament. Recently, good results have been reported from the administration of the anterior pituitary sex hormone.

Intermenstrual Pain (Mittelschmerz)

Intermenstrual pain is sometimes complained of by patients with sclero cystic ovaries. The pain develops about ten days after the cessation of the last period, corresponding therefore to the time of ovulation. Some patients give a clear history that the pain alternates from one side to the other, which suggests very strongly that the ovarian pain is related in some way to ovulation. *Intermenstrual pain should be attributed to an increase in tension within the ovaries developing about the time of ovulation.* There is no reason to believe that the pain is caused by the actual rupture of a follicle in the process of ovulation, and it seems more likely that the increased tension in the ovary is determined either by rapid enlargement of a ripening follicle or by the hypertrophy of a developing corpus luteum. Intermenstrual pain may be extremely severe and cause the patient to lie up. The operation of removing wedges of the cortex in the ovary gives bad results and should not be

recommended. Good results have been reported from the administration of the anterior pituitary sex hormone.

Ovarian Pain

Many women complain of a dull pain situated low down in one or other iliac fossa, which cannot be explained except by assuming that the pain is ovarian pain referred to the abdomen. The diagnosis of ovarian pain is made by exclusion. Such conditions as appendicitis, spastic colon, salpingitis, and chocolate cysts, must be excluded before the diagnosis of ovarian pain can be made. Moreover, physical examination should demonstrate that when the ovary is pressed upon during bimanual examination exactly the same pain is elicited as that complained of by the patient. Unless this physical sign can be obtained, a diagnosis of ovarian pain should not be made with confidence.

Cases of this sort are seen from time to time, and the discomfort complained of causes a certain amount of incapacitation. If such ovaries are removed they often show little histological change, except perhaps some degree of thickening of the tunica albuginea. Nevertheless, the pain disappears after their removal. Little is known of the cause of the pain, although the modern view is to assume that it is induced by sex disturbances. It is always as well to exclude factors of this sort before subjecting the patient to operation. Moreover, after the removal of one ovary the opposite ovary may become similarly affected.

Follicular Hæmatomata

Small follicular hæmatomata are extremely common, particularly in cases of uterine myomata and chocolate cysts of the ovaries. To the naked eye the ovary contains hæmorrhagic cysts, and on occasion the hæmatoma may burst into the peritoneal cavity and cause diffuse intraperitoneal bleeding of a severity equal to that met with in ruptured ectopic gestation. In most cases the hæmatoma is small and is restricted to the wall of the follicle, for the granulosa cell layer is non vascular and the membrana limitans externa separates the vascular theca interna from the cavity of the follicle. These hæmatomata are, therefore, almost invariably restricted to the theca interna layer. Except for the rare cases in which the hæmatoma bursts

into the peritoneal cavity, follicular hæmatomata have no clinical importance

Corpus Luteum Cysts

Corpus luteum cysts are not infrequent in early pregnancy, particularly in cases of ectopic gestation. They may be as large as $2\frac{1}{2}$ in in diameter. They are thin walled and contain clear yellow fluid. The wall of the cyst contains the normal convolutions of the corpus luteum. Corpus luteum cysts should not be regarded as pathological cysts of the ovary. Rather, they represent the result of over activity of the corpus luteum. Corpus luteum cysts rarely cause localising symptoms and are usually found on routine examination. If an ovarian cyst is found in the early weeks of pregnancy a corpus luteum cyst should be suspected and operation should be delayed, for a corpus luteum cyst subsequently becomes smaller as pregnancy advances. If an immediate operation is performed and the corpus luteum cyst removed, the patient is very likely to miscarry.

Corpus Luteum Hæmatomata

Corpus luteum hæmatomata are somewhat similar to follicular hæmatomata, being found fairly frequently in cases of myomata and chocolate cysts. With a corpus luteum hæmatoma the blood is effused not only into the theca interna layer, but also amongst the granulosa lutein cells, for at this stage of development of the follicle the granulosa layer has become vascularised. In consequence the hæmatoma involves the granulosa lutein layer and the cavity of the corpus luteum. From time to time diffuse intraperitoneal bleeding with collapse and shock follow upon the rupture of a corpus luteum hæmatoma into the peritoneal cavity.

Granulosa Lutein Cysts, the Lutein Cysts of Cases of Hydatidiform Mole and Chorion Epithelioma

The incidence of lutein cysts in the ovaries in cases of hydatidiform mole and chorion epithelioma is well known. The cysts are almost invariably bilateral and arise in about 59 per cent. of cases of hydatidiform mole and 94 per cent. of cases of chorion epithelioma. The ovaries are often enlarged to as much as 4 in in diameter, and each ovary may contain as many as fifteen or twenty cysts of this kind. The surface of the ovary

is free of adhesions, but a nodular appearance is produced by the cysts projecting under the surface. Large cysts as big as 3 in in diameter have been described. The cysts are thin walled, contain a yellow fluid and frequently a fibrinous or gelatinous substance is formed in the cavity. The inner walls of the cysts are unevenly covered with greyish yellow material. The cysts are of the nature of granulosa lutein cysts for they are all derived from follicles and show well marked luteinisation of both granulosa and theca interna cells. The granulosa lutein cells are as large as those found in the mature corpus luteum of the menstrual cycle but they are not arranged in folds and convolutions are absent. The cysts are almost certainly produced as the result of an increase in the anterior pituitary sex hormone in the blood stream. Not only do they correspond in their histology with the luteinised follicles produced in the ovaries of animals after the injection of the anterior pituitary sex hormone, but it is well established that this hormone is formed in large amount in cases of hydatidiform mole and chorion epithelioma. From time to time the large ovaries undergo torsion during the course of the pregnancy and cause acute abdominal symptoms which demand immediate operation.

✓ OVARIAN NEOPLASMS

The neoplasms of the ovary form an extremely complicated array of tumours which are difficult to classify pathologically. Little is known of their etiology, and with the epithelial tumours it is difficult to explain exactly how they arise. One of the simplest methods of classification is as follows

Epithelial Tumours

	Percentage Incidence
1 <i>Innocent</i>	
(a) Cystoma simplex	5
(b) Cystadenoma papillare	8.67
(c) " pseudomucinosum	30.8
2 <i>Malignant</i>	25.67

Connective Tissue Tumours

1 <i>Innocent</i>	
Fibromata	3.8
2 <i>Malignant</i>	
Sarcomata	1.3

	Percentage Incidence
eratoid Tumours	7.67
hocolate Cysts	12.67
Fimbrial Cysts	5.3

Chocolate cysts have been included in this series to illustrate their relative incidence, and fimbrial cysts, which are usually regarded as arising from ovarian relics in the broad ligament,

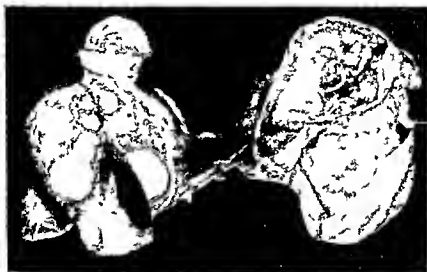


FIG. 224. The uterus together with a papillary serous cystadenoma of the ovary. The ovary lies on the right. The uterus contains multiple myomata together with a large adenomatous polypus of the endometrium of the body.

have been incorporated because in many ways they present clinical pictures similar to those of innocent ovarian cysts. The classification is incomplete because it does not include granulosa cell tumours or arrhenoblastomata. Nor are the different types of malignant ovarian tumour mentioned. A description of the more complicated forms will be given later in the chapter.

Pathology of Ovarian Neoplasms

Cystoma Simplex This ovarian tumour is a simple unilocular cyst, thin walled, containing clear serous fluid, lined by a single layer of ciliated epithelium. The tumour is relatively rare and arises with equal frequency at any decade of life. The tumours

is free of adhesions, but a nodular appearance is produced by the cysts projecting under the surface. Large cysts as big as 8 in. in diameter have been described. The cysts are thin-walled, contain a yellow fluid and frequently a fibrinous or gelatinous substance is formed in the cavity. The inner walls of the cysts are unevenly covered with greyish-yellow material. The cysts are of the nature of granulosa-lutein cysts for they are all derived from follicles and show well-marked luteinisation of both granulosa and theca interna cells. The granulosa lutein cells are as large as those found in the mature corpus luteum of the menstrual cycle but they are not arranged in folds and convolutions are absent. The cysts are almost certainly produced as the result of an increase in the anterior pituitary sex hormone in the blood stream. Not only do they correspond in their histology with the luteinised follicles produced in the ovaries of animals after the injection of the anterior pituitary sex hormone, but it is well established that this hormone is formed in large amount in cases of hydatidiform mole and chorion epithelioma. From time to time the large ovaries undergo torsion during the course of the pregnancy and cause acute abdominal symptoms which demand immediate operation.

✓ OVARIAN NEOPLASMS

The neoplasms of the ovary form an extremely complicated array of tumours which are difficult to classify pathologically. Little is known of their etiology, and with the epithelial tumours it is difficult to explain exactly how they arise. One of the simplest methods of classification is as follows :

Epithelial Tumours

	Percentage Incidence
1. <i>Innocent</i>	
(a) Cystoma simplex	5
(b) Cystadenoma papillare	8.67
(c) " pseudomucinosum	30.3
2. <i>Malignant</i>	25.67

Connective Tissue Tumours

1. <i>Innocent</i>	
Fibromata	8.3
2. <i>Malignant</i>	
Sarcomata	1.3

	Percentage Incidence
Teratoid Tumours	7.67
Chocolate Cysts	12.67
Fimbrial Cysts	5.8

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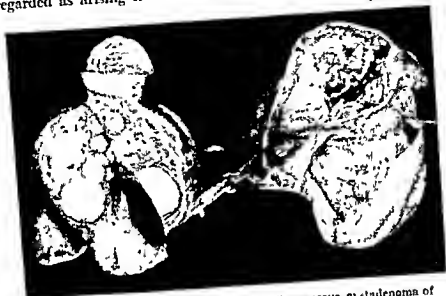


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FIG. 225. Multiflocular papillomatous cyst of the ovary.

are bilateral in 0.6 per cent. of cases. Very rarely the tumour may form an enormous swelling but in the average case the cyst is about 4 in. in diameter.

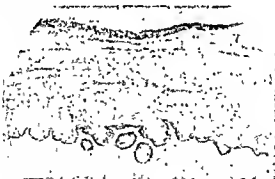


FIG. 226. Stationary form of papillomatous serous cystadenoma of the ovary.

Cystadenoma Serosum Papillare. This tumour should be regarded as arising from the simple cystoma simplex. The

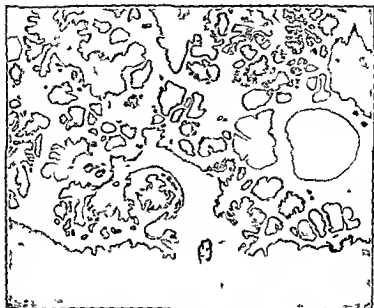


FIG 227 A proliferating form of serous cystadenoma of the ovary, tumour is usually multilocular, although it is rare for more than three or four loculi to be present The cysts are thin walled,

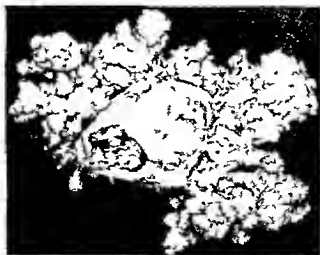


FIG 228 A surface papillomatous form of papillary cystadenoma of the ovary

contain clear serous fluid, and are lined by cubated epithelium The tumours are fairly frequent, the incidence being 8.67 per

cent. of ovarian neoplasms, and they may produce very large swellings. They are bilateral in a third of all cases. The tumours may arise at any age, and there is no particular age-incidence. The cysts contain papillomata in the wall and two forms of papillomata are recognised, namely, the stationary and the proliferating. In the stationary type, the papillae take the form of small warts on the inner surface of the tumour. In the proliferating type the papillomata are arborescent and plentiful, and may almost fill the loculi of the cyst. The surface epithelium



FIG. 220 A papillary serous cystoma of the ovary of the proliferating type with active epithelium

is active, but there is no invasion of the deeper tissues. In some cases the papillomata are spread over the outer surface of the cyst when they lead to ascites, and on occasion similar papillomata are scattered over the pelvic peritoneum. Although the tumours are actively proliferating they are innocent in type. Again, it is only rarely that they become malignant.

The two ovarian tumours above described, namely, the cystoma simplex and the cystadenoma papillare are now regarded as representing forms of ovarian Müllerianosis. It is established that the epithelium which lines these tumours is exactly the same as that which lines the normal Fallopian tube.

The cysts are undoubtedly neoplasms, yet the papillary cystadenoma associated with papillomata disseminated over the peritoneum is paralleled almost exactly by pelvic endometriosis which illustrates another example of ovarian Mullerianosis. In one case, the heterotopic epithelium is that of the Fallopian tube; in the other, it is endometrial in type.

Cystadeoma Pseudomucinosum. This form of ovarian cyst is the commonest of ovarian neoplasms, the incidence being approximately one-third of all such cases. The cyst is smooth, with a glistening white surface, and is multilocular. In young, actively growing tumours, the loculi are small, but with old-standing tumours, as the result of cohesion of adjacent loculi, only a relatively small number are present, although it is quite common even with old-standing tumours for a small zone of actively growing tissue to be recognised in one pole of the swelling. The tumours contain pseudomucin which closely resembles mucin except in its chemical properties, for it is not precipitated by the addition of acetic acid. It has been shown recently that some pseudomucinous tumours contain sucrase and invertin. The average pseudomucinous cystadenoma removed at operation is at least 12 in. in diameter, and it may reach mammoth dimensions, quite a number of tumours weighing more than 200 lbs. having been described. The tumours are rarely bilateral, and they arise with equal frequency in the three decades of life between the ages of 30 and 60. Although they arise in patients under 30 and over 60, their incidence at these ages is much less than between 30 and 60. There is some evidence that they arise more frequently in sterile



FIG. 230. Pseudomucinous cystadenoma of the ovary. A section through a piece of the tumour has been photographed showing the arrangement into loculi. The loculi are small and the tumour is actively growing.

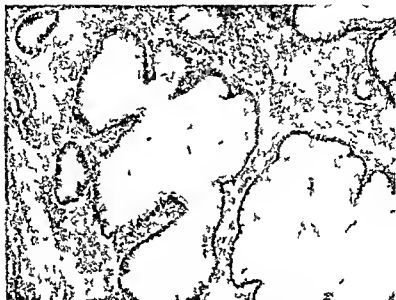


FIG. 211. A pseudomucinous cystadenoma of the ovary.



FIG. 212. Pseudomucinous cystadenoma of the ovary showing the structure of the epithelium.

women. They sometimes cause postmenopausal bleeding but they rarely give rise to other symptoms except a dull dragging



FIG 233 A papillomatous form of pseudomucinous cystadenoma of the ovary

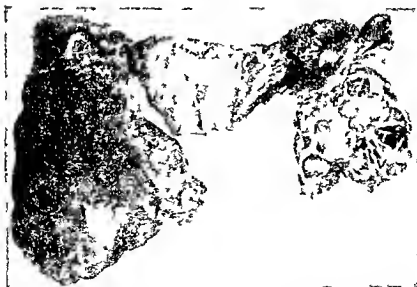


FIG 234 Bilateral carcinoma of the ovaries. The specimen on the left had undergone torsion. The tumours are of the pseudomucinous type

pain in the abdomen. In spite of the enormous size which the tumours may attain the operation of removal is usually carried

out quite simply without shock and with low mortality. In some cases the tumours burrow extraperitoneally and may be extremely difficult to remove.

Histology The tumour is composed of a series of loculi separated from each other by connective tissue. Each loculus is lined by high columnar epithelium the protoplasm of which is translucent. The nucleus is usually flattened out against the base of the cell. Large ovoid cells are usually found amongst the tall



FIG. 235. Carcinoma of the ovary of the serous papillomatous type.



FIG. 236. Carcinoma of the ovary. The tumour is almost solid but is of the pseudomucinous type.

columnar cells and are displaced away from the basement membrane towards the cavity of the loculus. In proliferating tumours the epithelium is heaped up to form papillomata but large papillomata are relatively uncommon. In actively growing tumours areas of degeneration are commonly found, probably because epithelial elements of the tumour outstrip their blood supply in their growth so that adjacent loculi communicate. Although the tumours are frequently actively proliferating it is relatively rare for them to become malignant, and probably in not more



FIG 237. Psammocarcinoma of the ovary

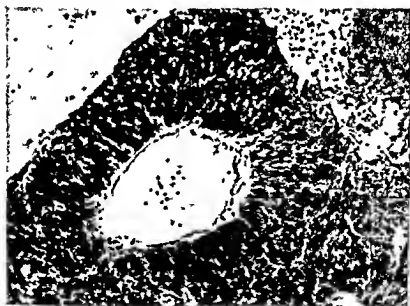


FIG 238 Serous papillomatous carcinoma of the ovary

than 8 per cent. of cases can true malignant change be demonstrated in large pseudomucinous cystadenomata.

Ovarian Carcinomata. Ovarian carcinomata are extremely common, comprising at least 25 per cent. of all ovarian neoplasms. The tumours are not infrequently secondary deposits in the ovaries from primary growths elsewhere in the body, and probably about 20 per cent. of all cases of ovarian tumours which are diagnosed as carcinomata are secondary deposits in the ovary from a primary growth elsewhere. The majority of malignant ovarian tumours are related in some way or other to the innocent pseudomucinous cystadenoma for there is often a



FIG. 239 A glandular papillomatous carcinoma of the ovary

close resemblance in the histology. The interpretation which should be placed upon this resemblance is that malignant ovarian tumours and pseudomucinous cystadenomata probably arise from the same structures. On the other hand, the tumour is usually either innocent or malignant at the beginning of its development. If innocent it forms a pseudomucinous cystadenoma; if malignant, it gives rise to an ovarian carcinoma.

The pathology of primary ovarian carcinomata is extremely difficult and a detailed description of the different types is beyond the scope of this work. A simple method of classification

is to group the primary carcinomata of the ovary into the following types —

- (a) Papillomatous
- (b) Pseudomucinous
- (c) Solid

Papillomatous Tumours These tumours are characterised by the presence of papillomata in the cyst wall. The papillomata are thick and friable and quite different from the delicate arborescent papillomata of innocent tumours. The papillomata infiltrate the wall of the tumour and ulcerate through to the

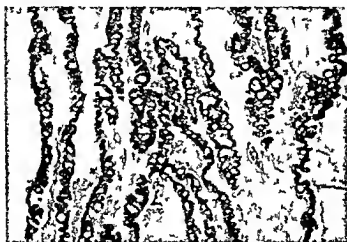


FIG. 240 A malignant pseudomucinous cystadenoma

peritoneal surface. The ensuing peritoneal irritation gives rise to ascites and secondary deposits become disseminated over the peritoneum. Three types can be recognised.

The first, the psammocarcinoma, resembles the innocent cystadenoma papillare, but the epithelium is malignant in type and infiltrates the cyst wall. Psammomatous bodies are found amongst the papillomata.

The second type, which is best called the malignant serous papillomatous tumour, is one of the commonest forms of ovarian carcinoma. It is usually unilocular, containing serous fluid, and has large friable papillomata in the cyst wall. The histology of this form of tumour is interesting because the tumour consists of a series of villous like processes. The core of each villus contains a large vessel and the malignant cells are packed closely

together being fusiform in shape and showing a tendency to squamous metaplasia.

In the third type the papillomatous tumours contain pseudomucin and are unilocular. The papillomata consist of a series of thin villous processes covered by high columnar epithelium which shows typical malignant characters.

Pseudomucinous Tumours. The tumours consist of a series of loculi which are irregular in shape and lined by a thick layer of malignant epithelium. Superficially, therefore, the structure



FIG 241. A pseudomucinous carcinoma of the ovary. There is active mitoses in the epithelium while the cavity of the loculus above contains degenerate cells

resembles that of an innocent pseudomucinous cystadenoma with well-marked malignant change in the epithelium.

Solid Carcinomata of the Ovary. In these cases the carcinoma takes the form of a solid tumour although nearly always there is some attempt at the formation of loculi. The tumours vary in their histological characters according to their malignancy.

Secondary Carcinoma of the Ovaries. Ovarian metastases are extremely common from primary growths of the stomach, breast, large intestine, the body of the uterus, the thyroid and the gall bladder. In autopsy material the incidence of secondary deposits in the ovary is higher than that of primary growths.

With clinical material the position is different, and probably only about 20 per cent. of clinically malignant ovarian tumours are secondary deposits from primary growths elsewhere. The other 80 per cent. comprise primary ovarian carcinomata. Two forms of secondary carcinoma of the ovary are recognised. In the first the growth corresponds in its histology with the primary growth. Dissemination to the ovaries takes place either by implantation from metastases within the peritoneal cavity or by retrograde lymphatic spread. Both ovaries are replaced by solid carcinomata and multiple secondary deposits are usually

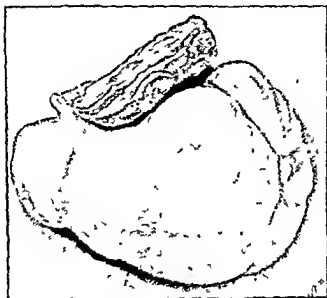


FIG. 242. Krukenberg tumour of the ovary

disseminated over the peritoneum. A curious feature of the cases is that the ovarian tumours are much larger than the other secondary deposits, which is explained by supposing that the ovaries form a much better environment for the growth of malignant cells than the other intraperitoneal viscera.

The second type of secondary ovarian carcinoma is the Krukenberg tumour.

The Krukenberg Tumour. Krukenberg tumours are almost invariably bilateral. They have smooth surfaces which may, however, be slightly bossed, and they are freely movable in the abdomen. The tumour retains the shape of the normal ovary and has a peculiar solid waxy consistence, although cystic spaces

together being fusiform in shape and showing a tendency to squamous metaplasia

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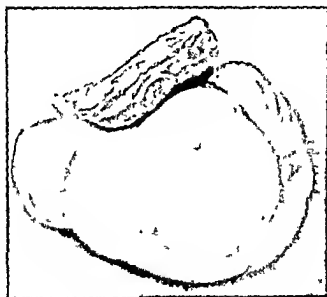


FIG. 212. Krukenberg tumour of the ovary

due to degeneration of the growth are not infrequent. Histologically the tumour has a fibrosarcomatous stroma amongst which are scattered large signet-ring-like cells. These cells are ovoid in shape with a granular cytoplasm and the nucleus is compressed against one pole of the cell so that the outline of the cell resembles a signet-ring. The tumours are secondary growths in the ovary and almost invariably arise from a primary carcinoma of the stomach. The Krukenberg tumour outstrips the primary growth in size, and unless the histology of the tumour is known the case may be regarded as one of primary malignant ovarian carcinoma, particularly as the tumours are

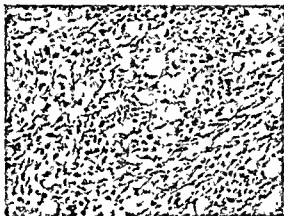


FIG. 243. Krukenberg tumour.

usually freely movable without obvious intraperitoneal metastases. The tumours almost certainly arise by retrograde lymphatic spread, for the carcinoma cells pass from the stomach to the superior gastric lymphatic glands which receive the lymphatics from the ovary. Retrograde lymphatic spread can be demonstrated in early cases when carcinoma cells are found infiltrating the ovary by way of the lymphatics in the medulla.

Coincident Carcinoma of the Ovaries and the Body of the Uterus. Cases of coincident carcinoma of the ovaries and the body of the uterus are not uncommon. In some cases the growth is primary in the body of the uterus and forms secondary deposits in the ovaries. In other cases, particularly with very malignant ovarian tumours, the primary growth is in the ovaries and secondary deposits reach the cavity of the uterus either by
 ∴ permeation or by implantation. The other group of



FIG 244. A coincident carcinoma of the body of the uterus and of the ovary. On the right the ovary is replaced by carcinoma

cases is well recognised in which the ovarian carcinomata are different in type from the carcinoma of the body of the uterus. The cases are of clinical importance for if malignant ovarian



FIG 245. Metastases of carcinoma of the stomach in the medulla of the ovary. To the naked eye the ovary appeared normal, but the lymphatics of the medulla contain a large number of malignant cells, the ovary being infected by retrograde lymphatic spread.

tumours cause post menopausal bleeding the uterus should always be removed together with the ovarian tumours

Metastases of Ovarian Carcinomata The earliest and most important metastases from ovarian carcinomata are the multiple secondary deposits which form over the peritoneum. The malignant cells of the primary growth erode through the capsule of the tumour and become disseminated over the peritoneal cavity. The cells become implanted on the peritoneum and form friable papillomata which lead to ascites. The secondary deposits are always most numerous in Douglas's pouch and in the omentum. The secondary deposits in Douglas's pouch can be felt on vaginal examination, and this sign is of the greatest importance in the establishment of the diagnosis that an ovarian tumour is malignant. The secondary deposits in the omentum are interesting because they illustrate the remarkable property which the omentum possesses of absorbing particulate matter from the peritoneal cavity.

Bilateral Character of Ovarian Tumours Ovarian tumours show a well marked tendency to be bilateral. This tendency is particularly well marked with malignant tumours, and it has been computed that about 70 per cent of primary ovarian carcinomata are bilateral, while in almost all cases of secondary tumours both ovaries are involved. With innocent tumours the cysts are bilateral in about 16 per cent of cases. There is reason to believe that even with malignant ovarian tumours the two ovaries are attacked simultaneously by the disease and that the involvement of one ovary by secondary deposits from the other is very exceptional. With secondary ovarian carcinomata, if the involvement is by retrograde lymphatic spread, one would expect both ovaries to be involved simultaneously. Similar remarks apply when implantation of carcinoma cells is the cause of development of secondary deposits in the ovaries.

Metastases in the Uterus In advanced cases of carcinoma of the ovaries the tumour becomes adherent to surrounding structures so that the uterus is directly infiltrated by the growth. The peritoneal surface of the uterus is also infiltrated in some cases by carcinoma cells disseminated over the peritoneum. Rarely, metastases form in the endometrium of the uterus as the result of carcinoma cells passing along the Fallopian tube into the cavity of the uterus. In some cases of carcinoma of the ovaries secondary deposits are formed in the vaginal walls, and such metastases correspond to those found in cases of

chorion epithelioma and of carcinoma of the body of the uterus

Metastases in Operation Scars It is not uncommon after the removal of malignant ovarian tumours for metastases subsequently to form in the operation scar

Spread by Way of Blood Stream It is rare for carcinoma of the ovaries to spread by way of the blood stream, but with very malignant tumours metastases may be disseminated in this way over the body

Lymphatic Spread It is rare to find clinical evidence of lymphatic permeation with carcinoma of the ovaries. The regional lymphatic glands of the ovaries are the superior gastric glands which are usually impalpable if there is well marked ascites. Sometimes, however, the malignant cells permeate to the mediastinal glands when they may ulcerate into the pleural cavity and cause pleural effusion. Very rarely secondary deposits may be found above the left clavicle. It should be remembered that the secondary deposits disseminated over the peritoneum permeate into the subperitoneal lymphatics so that the pelvic lymphatic glands become infiltrated.

The most important metastases of malignant ovarian tumours are those which form over the peritoneum and lead to the development of large tumours in the omentum. Most patients with carcinoma of the ovaries die as the result of the ascites. It must also be pointed out that secondary deposits of carcinoma of the ovaries rarely involve the liver, for the ovarian vessels belong to the systemic system and not to the portal system like those of the intestine and stomach.

Connective Tissue Tumours of the Ovary

Of the innocent connective tissue tumours of the ovary ovarian fibromata are the most common. Pure myomata are rare tumours and very few other innocent connective tissue tumours have been described.

Ovarian Fibroma This tumour, which is not uncommon, comprises about 3 per cent. of the ovarian neoplasms and has no particular age incidence. The tumour is oval in shape with a smooth surface and large veins which are always recognised in the capsule. The consistence is firm and harder than that of a uterine myoma. The tumour frequently undergoes degeneration so that cystic spaces are found towards the centre and calcareous degeneration is not uncommon. The tumours are

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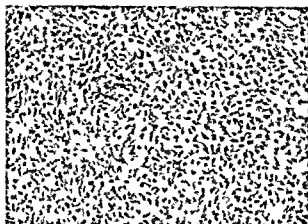
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usually about 6 in in diameter but they sometimes become much larger than this

Microscopical examination shows the tumour to be composed



110 210 Sarcoma of the ovary



FIG 247 Rhabdomyosarcoma of the ovary, showing striated muscle cells

of a network of spindle-shaped cells which closely resemble the spindle cells of the ovarian cortex. In large tumours the connective tissue cells are elongated and an intercellular matrix

becomes prominent. The tumours are often accompanied by ascites. Three types are recognised. In the first the tumour takes the form of a surface papilloma on the ovary. In the second type there is a small encapsulated fibroma arising in an ovary so that normal ovarian tissue can be recognised at one pole of the tumour. In the third type the fibroma replaces the ovary completely.

Sarcoma. Ovarian sarcomata are rare tumours and are less frequent than sarcomata of the testicle. They arise most frequently after the menopause, particularly in multiparæ. They give rise to multiple metastases. Rhabdomyosarcoma of the ovary has been described.

Teratoid Tumours

Under this heading are included dermoid cysts and solid teratomata.

Dermoid Cysts. Dermoid cysts are usually unilocular swellings with smooth surfaces, seldom attaining to more than 6 in. in diameter. They contain sebaceous material and hair, and the wall is lined in part by squamous epithelium which contains hair follicles and sebaceous glands. Teeth, bone, cartilage, thyroid tissue and bronchial mucous membrane, are commonly found in the wall. Sometimes the sebaceous material may be collected together in the form of small balls, and as many as 1,000 sebaceous balls of this type have been counted in a dermoid cyst. The inner surface of the dermoid cyst is always irregular and contains what is called a "focus" or "embryonic node," from which the hairs project, and in which the teeth and bone are usually found. The nomenclature "dermoid cyst" is



FIG 248. A dermoid cyst of the ovary. The fallopian tube lies above, the dermoid cyst below. The cyst is full of hair and sebaceous material. The tube and ovary had undergone torsion.



FIG. 249. Dermoid cyst of the ovary. The cyst is lined by a squamous epithelium. Sebaceous glands open into the cavity of the cyst. Hair follicles are also present.



FIG. 250. A solid teratoma of the ovary.

inaccurate, for in addition to ectodermal tissues, tissues from both the mesoderm and endoderm are usually found in some part of the tumour. Moreover, squamous epithelium is usually restricted to the embryonic node and elsewhere the wall of the cyst is lined by columnar or transitional epithelium. It is extremely rare for pancreas or liver tissue and intestinal mucous membrane to be found in the wall of a dermoid cyst.

Dermoid cysts frequently arise in association with pseudomucinous cystadenomata to form a combined tumour, part of



FIG. 231. *Struma ovarii*.

which consists of a dermoid cyst while the rest has the characteristic structure of a pseudomucinous cystadenoma. Perhaps as many as 89 per cent. of cases of dermoid cyst are combined tumours of this kind. This association suggests that the origin of the two forms of ovarian tumour is related.

Multiple dermoid cysts in the same ovary are well recognised and extra-ovarian dermoid cysts arise from time to time in the lumbar region, in the utero-vesical septum, in the parasacral region, and in the recto-vaginal septum. The combined tumours tend to arise in patients between the ages of 20 and 30, while simple dermoid cysts have a maximum age incidence between 40 and 50. The tumours may, however, arise at any age.

They are not infrequently bilateral and statistics show that they arise from the right ovary more frequently than from the left

Dermoid cysts are innocent ovarian tumours but malignant change arises in them from time to time. Usually a squamous celled carcinoma develops from the ectodermal tissues but mammary carcinomata and malignant thyroid tumours have been described. Sometimes a sarcoma develops from the tissues of the tumour.

Solid Teratoma of the Ovary These tumours are very rare. They are mainly solid and the cut surface has a peculiar trabeculated appearance. Almost invariably large loculi are found beneath the capsule. The solid part of the tumour contains cartilage and bone, while hair and sebaceous material are found in the cystic spaces. The solid area also contains plain muscle, brain tissue, glia, pia mater, and intestinal mucous membrane. The formation is conglomerate without order or arrangement. Most solid teratomata of the ovary are malignant tumours because of sarcomatous change, but a fair proportion, probably about 20 per cent, are innocent.

RARE OVARIAN TUMOURS

From time to time ovarian tumours are found which cannot be accurately graded pathologically. In recent years it has been found possible to identify some interesting types of the rare ovarian tumours.

Struma Ovarii This tumour consists of thyroid tissue similar to that of a thyroid adenoma. The tumour is solid, consisting almost entirely of thyroid tissue and should be clearly distinguished from a dermoid cyst with thyroid tissue in its wall. To the naked eye the tumour resembles a small pseudo-mucinous cystadenoma but the material contained in the vesicles is colloid and gives the reactions for iodine. Some cases lead to the development of thyrotoxicosis. Most of the tumours are innocent, but malignant thyroid tumours have been recorded.

Granulosa Cell Tumour Granulosa cell tumours are interesting growths of the ovary, for they are composed of cells closely resembling the granulosa cells of the Graafian follicle. The cells are arranged either in cords or trabeculae, and are often surrounded by structureless hyaline tissue, which resembles the glass membrane of an atretic follicle. Moreover, small



FIG 252 Uterus and granulosa cell tumour of the ovary. The tumour is free of adhesions and has the characteristic trabeculated appearance with hemorrhagic areas. The wall of the uterus is thickened through a myohyperplasia and the endometrium is hemorrhagic and thickened.

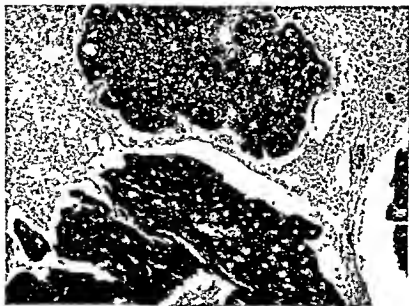


FIG 253 Granulosa cell tumour

Call Exner bodies can usually be found in some part or other of the tumour. Three histological types of granulosa cell tumours have been identified: (a) an early undifferentiated form which consists of a solid mass of granulosa cells, (b) a trabecular form, and (c) a folliculoma type in which the granulosa cells are grouped around spaces filled with coagulated secretion. Most granulosa cell tumours are encapsulated and most are innocent. Nevertheless, malignant tumours are well recognised. The metastases are interesting because the opposite ovary first



FIG. 254. The endometrium from a case of granulosa cell tumour from a woman of sixty-three. The endometrium shows oestrogenic hypertrophy comparable to the proliferative hypertrophy of the menstrual cycle. There is no secretory hypertrophy. The dark areas beneath the surface epithelium are caused by extravasated blood.

becomes involved, then metastases develop in the lumbar region and, finally, secondary deposits become scattered in the mesentery, the liver and mediastinum. To the naked eye, the tumours are usually lobulated swellings of soft, friable consistence. The cut surface is grey and reticulated, and almost always there is some degree of interstitial hæmorrhage. The tumours are most common between the ages of 40 and 50, although they arise in young women and even in children before puberty. If the tumour arises during the childbearing period of life, the patient usually gives a history of amenorrhœa

followed by continuous bleeding. If the tumour arises in a patient of post menopausal age, it produces post menopausal hæmorrhage.

□ The tumours are oestrogenic and oestrin can be extracted from the tissues of the tumour and from the patient's urine. Moreover, the uterus undergoes myohyperplasia and the endometrium shows oestrogenic proliferation and cystic glandular hypertrophy. The treatment is of necessity surgical. In post menopausal patients the uterus should be curetted to establish that there is no coincident carcinoma of the body of the uterus.

Theca Cell Tumour

This tumour is seen only rarely and usually arises after the menopause. It is nearly always unilateral and forms a solid mass. The cut surface is often yellow in colour. The tumour consists of spindle shaped cells together with fat laden polyhedral cells which resemble the theca lutea cells of the Graafian follicle. The tumour is intensely oestrogenic and causes post menopausal hæmorrhage. The tumour is usually innocent but malignant forms have been described. The tumour was originally called Xanthofibroma thecacellulare.

The Brenner Tumour

This tumour usually arises in women of post menopausal age and can be regarded as a benign fibro epithelial growth. It is almost always unilateral and small although large tumours have been described. It is often found in combination with teratoma or a granulosa cell tumour or a pseudomucinous cystadenoma. It sometimes causes uterine bleeding, but it is not oestrogenic. Microscopically the tumour consists of nests of cells arranged in columns or cords and the cells are sometimes transitional or squamous in type. If a column is cut across secretion droplets which stain deeply with eosin may be found in the middle of the cord. This appearance was originally mistaken for that of a young Graafian follicle so that the tumour was regarded as an oophoroma.

Arrheoblastoma

These tumours are extremely rare and usually arise in young women. The tumours are virilising and cause amenorrhœa,

hirsuties, mammary atrophy and hypertrophy of the clitoris. They are of low malignancy, often polycystic and unilateral.

A tumour which is referred to as a gynandroblastoma has been described which combines the characteristics of the granulosa cell tumour and an arrhenoblastoma.

Virilising Lipoid Tumours

These tumours are encapsulated, solid and usually malignant. They consist of large polyhedral cells together with cells similar to the Leydig cells of the testis. The tumours are intensely virilising. The histogenesis of the tumour is disputed. The tumour is regarded as being either a hypernephroma, a luteinoma or a Leydig cell tumour.

Dysgerminoma

This tumour corresponds exactly to the seminoma of the testis and is probably fairly common. It is usually malignant. It usually arises in young women or in children. The tumour consists of large cells arranged in bunches or alveoli. Lymphocytes and giant cells are always found amongst the tumour cells. The tumour is neutral and does not secrete either male or female sex hormones.

Mesonephroma

This tumour described quite recently is composed of tissue which is similar to that of the mesonephros. It may be either benign or malignant.

Histogenesis of Ovarian Tumours

Fibromata Small ovarian fibromata are fairly common tumours forming white rounded excrescences in the cortex of the ovary. The tumours arise from the stroma cells of the cortex of the ovary and in the earliest stage are represented by areas of hyperplasia. With subsequent growth a capsule becomes differentiated and the tumour grows at the expense of the normal ovarian tissue, so that finally the ovary is completely replaced by the fibroma. The structure of a large ovarian fibroma is not unlike that of the stroma of the ovarian

cortex, except that the constituent cells are more embryonic in type

With small fibromata it is not uncommon to see hyperplasia of the covering surface epithelium, which tends to become invaginated into the fibroma to give an appearance resembling

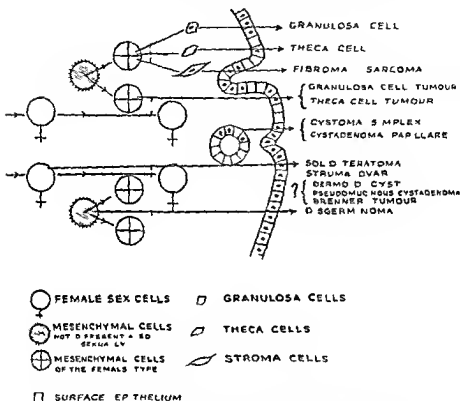


FIG. 255 Scheme illustrating the origin of ovarian tumours. The cells lying to the right of the dotted line are found in the adult ovary. The invaginations of the surface epithelium are commonly seen.

that of a fibroadenoma. Large fibroadenomatous of the ovary, however, are almost unknown.

Cystoma Simplex and Cystadenoma Papillare These tumours almost certainly originate from downgrowths of the surface epithelium of the ovary into the cortex. Small downgrowths of this sort are extremely common, even in normal ovaries, and small cysts, only recognised by microscopical examination, are fairly frequent. The cystoma simplex originates in invaginations of this kind. Papillary forms result from intracystic growths into such tumours, and it has been shown that the

development of intracystic growths arises early in the life history of the papillary cystadenoma. Probably psammomatous carcinomata and papillary serous carcinomata of the ovary arise in the same way.

The origin of the tumours from downgrowths of the surface epithelium of the ovary is universally accepted at the present

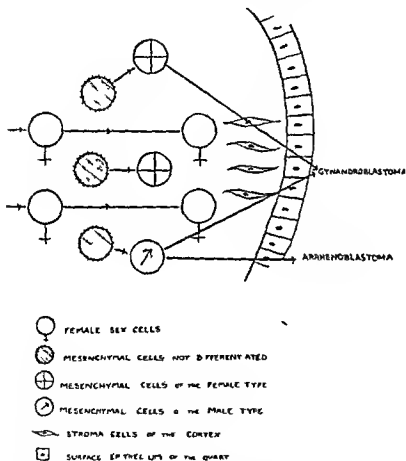


FIG. 256 Scheme to show the development of virilising ovarian tumours.

day and the tumours are regarded as examples of ovarian Mullerianosis. It is also accepted that the epithelial lining of the tumours is identical with that of the Fallopian tubes and the cystoma simplex and the cystadenoma papillare are some times described as endosalpingiomas of the ovary.

Granulosa Cell Tumours. Granulosa cell tumours consist of cells identical with the granulosa cells of Graafian follicles and theca cell tumours of cells similar to those of the theca interna cells. As both types of tumour may arise after the menopause, when there are no Graafian follicles in the ovaries, the tumours cannot be regarded as being derived from mature cells of this type. They are therefore regarded as originating in mesenchymal cells which have been differentiated sexually. The arrhenoblastoma is regarded as being derived from mesenchymal cells of the male type which for some reason or other are found in the ovary. Disgerminoma can be explained on the assumption that it originates in mesenchymal cells prior to their sexual differentiation into male and female types (see Fig. 255). These explanations are ingenious but are purely hypothetical. They explain the nature of the tumours and particularly their hormonal effects.

Teratoid Tumours. The origin of these tumours is much disputed. Ideas of parthenogenesis and enclosed blastomeres are unfashionable at the present day. Dermoid cysts never contain trophoblastic or gonadic tissue and the absence of chorionic tissue eliminates the idea that a dermoid cyst develops as a result of parthenogenesis or from an enclosed blastomere. On the other hand, malignant solid teratomata probably arise from toti-potent cells.

Pseudomucinous Cystadenomata. Although this tumour is the commonest of all ovarian tumours, its origin is unexplained. The cells of the tumour are paralleled in the body only by those of the cervix and the large intestine. The two present-day theories are (a) that the tumour represents an example of ovarian Müllerianosis, with metaplasia of the ovarian surface epithelium into cervical epithelium and (b) that the tumour arises from large intestine elements of a dermoid cyst. Excellent arguments can be put forward against both theories.

Brenner Tumour. This tumour is usually frequently associated with pseudomucinous cystadenoma, when there is probably some relation between their origins.

Complications of Ovarian Tumours

Axial Rotation: Torsion. Torsion of an ovarian cyst is a very common complication, and in about 12 per cent. of cases of ovarian tumour which come to operation the tumour has

undergone axial rotation Chocolate cysts and malignant ovarian tumours are usually fixed by adhesions so that it is very rare for these types of ovarian tumour to undergo torsion. On the other hand, fimbrial cysts, the broad ligament cysts which will be described in the next chapter, are the most likely

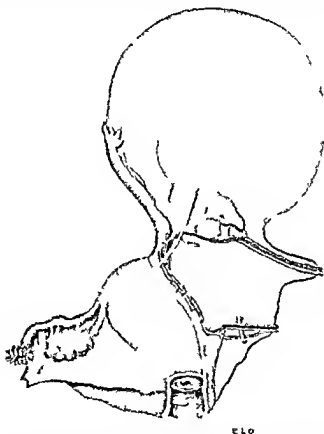


FIG. 257 The pedicle of an ovarian cyst showing the relations of the ovarian vessels the ovarian ligament and the Fallopian tube together with the anastomosing branch of the uterine artery (After Stoeckel)

of pelvic tumours to undergo torsion, probably because they develop in the outer part of the broad ligament above the infundibulo pelvic fold so that they have a greater degree of mobility than an ovarian tumour. In most cases the cyst is about six inches in diameter when it undergoes torsion and it is very exceptional for the tumour to rotate while it

lies in the pelvis. After it has risen above the level of the pelvic brim it acquires a much greater degree of mobility and is therefore more prone to rotate. Sometimes very large tumours undergo rotation. Because of the high incidence of pseudo-mucinous cystadenomata, in the majority of cases of torsion of an ovarian cyst the tumour is of this type. There is no particular age incidence. The right and left sides are involved with equal frequency. In most cases the tumour rotates so that its anterior surface turns towards the patient's right side. It is not uncommon for the tumour to be rotated through three or more complete circles. As the result of rotation the veins in the pedicle become occluded, so that the tumour becomes congested, and after a time there is interstitial hæmorrhage in the wall of the tumour and into the loculi. The increased tension causes severe abdominal pain together with the signs of peritoneal irritation. Subsequently, adhesions form to surrounding structures, so that the omentum and intestines become attached to the tumour, and on rare occasions the cyst may become infected. It is, however, extremely rare for the tumour to undergo necrosis from occlusion of the arteries in the pedicle. In rare cases, as a result of atrophy of the pedicle, the tumour becomes detached and finds a new blood supply from adhesions to some other structure within the abdomen.

A variety of hypotheses has been advanced to explain why rotation develops. The contraction of adhesions, asymmetrical growth, and movements of the sigmoid colon, have been suggested to explain the rotation of an ovarian cyst. These hypotheses do not explain why the tumour may be rotated through as many as three complete circles. Moreover, the pedicle of the tumour is attached to its inferior pole. It is obvious that a tumour would be more likely to undergo axial rotation if it were to hang down under the influence of gravity from an attachment high up in the abdomen. The most probable explanation of rotation of an ovarian cyst is that the cause is hæmodynamic. It is suggested that some violent movement—a history of which is almost invariably obtained in cases of torsion—initiates the twist, and as a result the ovarian artery itself becomes twisted. The pulsation in the vessel will then cause a series of tiny impulses to be transmitted to the pedicle, each of which will aggravate the twist. After a time the degree of torsion will be such that the veins in the pedicle become

occluded and then the patient will complain of severe abdominal pain

Rupture Rupture of an ovarian cyst may be traumatic or spontaneous Traumatic rupture results from direct violence to the abdomen, and it may happen during labour when a cyst is impacted in Douglas's pouch in advance of the presenting part It is not uncommon for a small cyst to rupture during bimanual examination if it is thin walled The patient then experiences sudden abdominal pain but no after effects are to be expected

Spontaneous rupture of ovarian cysts is not uncommon With malignant ovarian tumours, particularly those of the papillomatous type, the carcinoma cells infiltrate through the connective tissue capsule to ulcerate into the peritoneal cavity Similarly, with innocent papillomatous serous cystadenomata a similar process takes place The most interesting cases of spontaneous rupture are, however, those arising with actively growing pseudomucinous cystadenomata Sometimes the epithelial elements of the growth grow so rapidly that the connective tissues of the capsule are unable to keep up with them, so that a spontaneous rupture of the tumour is the result and pseudomucinous material is discharged into the peritoneal cavity In most cases there is no serious after effect, but very rarely the condition pseudomyxoma of the peritoneum develops

Pseudomyxoma of the Peritoneum In this condition the peritoneal cavity is filled with coagulated pseudomucinous material which is adherent to the omentum and intestines The material cannot be removed completely at operation because of its attachment to bowel and the condition tends to recur after operation Pseudomyxoma of the peritoneum in women is usually associated with a pseudomucinous cystadenoma of the ovary, but it is extremely common for a leaking mucocele of the appendix to co exist The condition is more common in men than in women, when it is associated either with a mucocele of the appendix or with a carcinoma of the large intestine In pseudomyxoma of the peritoneum the mesothelium of the peritoneum is converted, in part, into high columnar cells which are histologically similar to those lining a pseudomucinous cystadenoma of the ovary, and these cells secrete the mucinous material into the peritoneal cavity The prognosis in pseudomyxoma of the peritoneum is bad, even after the ovaries and the appendix are removed *Pseudomyxoma of the ovary* is

a rare condition in which a pseudomucinous cyst is surrounded by pseudomucinous material and the structure of the original tumour is, to a great extent, lost.

Infection Infection of ovarian tumours is infrequent at the present day. Most cases follow upon acute salpingitis when the cyst becomes involved by direct spread. At other times the cyst becomes infected during the puerperium when as a result of a tumour causing difficulty in child birth, the patient is attacked by puerperal sepsis. In puerperal cases the infection is of a severe degree and may cause either spreading peritonitis or septicæmia. Infection may also follow upon torsion when as the result of adhesions to the intestine the tumour becomes directly infected. Infection by the way of blood stream is uncommon. Infected ovarian tumours are always adherent to adjacent viscera and quite often discharge their contents into the rectum.

Extraperitoneal Development From time to time ovarian tumours burrow extraperitoneally during their development and may even spread upwards into the perinephric region. The removal of such tumours is extremely difficult and there is moreover, a danger of injuring the ureter. Again it is not uncommon for diffuse extraperitoneal hæmorrhage to follow upon the removal of tumours of this kind.

Clinical Features of Ovarian Tumours

Age Incidence It has been stated already that serous cystomata and papillary cystadenomata have no especial age incidence. Pseudomucinous cystadenomata arise most frequently between the ages of thirty and sixty with equal proportion during the three decades between these ages.

Dermoid cysts arise most frequently between the ages of forty and fifty, and in the decade between twenty and thirty but they may arise at any age.

Fibromata may arise at any age, but they are most common between thirty and forty. Malignant ovarian tumours arise most frequently between the ages of fifty and sixty and approximately two thirds of all cases of malignant ovarian tumours arise after the age of fifty. Nevertheless malignant ovarian tumours sometimes arise in young women when they tend to be particularly malignant.

Secondary ovarian carcinomata are met with most frequently

in patients between the ages of thirty five and fifty. There is no clear evidence that parity is related to the development of any type of ovarian tumour.

Innocent Ovarian Tumours

Symptoms Although innocent ovarian cysts frequently give rise to enormous tumours they cause relatively few symptoms. Indeed, in most cases of innocent ovarian tumours the patient's

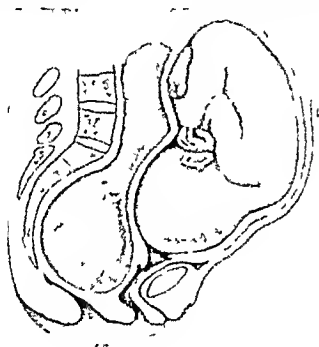


FIG. 223 Ovarian cyst obstructing labour (Liden and Holland's "Obstetrics")

attention is first directed to abdominal swelling. The average pseudomucinous cystadenoma removed at operation is about the size of a football and it is not until the tumour has reached this size that it causes sufficient abdominal enlargement to make the patient realise that something is wrong.

Ovarian tumours hardly ever affect the menstrual functions, it is unusual for the rhythm of menstruation to be disturbed. Innocent ovarian tumours even though they are bilateralorrhagia is hardly ever present in cases of ovarian tumour.

Amenorrhœa, again, is a rare symptom. It should be remembered, however, that multilocular cysts are not uncommon in women of menopausal age, so that from time to time one sees the clinical picture of a large ovarian cyst arising coincidentally with the onset of the menopause. Even with malignant ovarian tumours when both ovaries are involved it is unusual for the patient to develop amenorrhœa.

Pressure symptoms arise from time to time in cases of large ovarian tumours. Mammoth tumours lead to embarrassment of respiration and to palpitations as the result of pressure upon the diaphragm, and from pressure upon veins the patient may develop bilateral œdema of the feet. Urinary symptoms sometimes develop with ovarian tumours. Frequency of micturition is a relatively common complaint, probably because of pressure upon the bladder and very rarely retention of urine may develop through the tumour becoming incarcerated in the pouch of Douglas. Bowel symptoms are almost unknown in cases of ovarian tumour, probably because most tumours are cystic and the soft consistence is insufficient to obliterate the lumen of the bowel. Pain is an extremely common symptom, even with innocent ovarian tumours. Apart from complications such as torsion the pain is, however, never of a severe degree, and it takes the form of a dull dragging pain or a constant ache in one or other iliac fossa. The etiology of the pain is unknown but it is most likely to be caused by pressure upon the pelvic viscera.

With large ovarian cysts it is not uncommon for the patient to develop what is referred to as ovarian cachexia, when the patient becomes emaciated. Such cachexia has no relation whatsoever to the development of malignant change in the tumour, and it may be of an extreme degree, even though the tumour is innocent.

Axial rotation of an ovarian cyst leads to extremely severe abdominal pain. Sometimes the severity is comparable to that of a perforated gastric ulcer. The patient may become shocked and collapsed, with subnormal temperature and a weak thready pulse. Nausea and vomiting are common symptoms and later distension and constipation develop. Subsequently, the temperature rises and the pain remains constant and severe. On examination, the abdomen moves poorly and is distended. The cyst is tense and tender, and there may be tenderness and rigidity of the abdominal wall.

The increased tension alters the consistence of the tumour, so that there may be difficulty in establishing that the abdominal tumour is cystic. Difficulty may therefore arise in diagnosis, and the tumour may be mistaken for a uterine myoma undergoing red degeneration. Further, the abdominal physical signs are similar to those obtained in cases of concealed accidental hæmorrhage.

Infection of ovarian cysts is a rare complication but it should be suspected if there is abdominal tenderness and rigidity with pyrexia associated with the presence of the ovarian cyst.

Physical Signs

The typical ovarian cyst forms an abdominal swelling detected by visual examination. The abdominal wall can be seen to move over the swelling when the patient takes a deep inspiration. The tumour is symmetrically situated in the abdomen and is not more prominent to one side of the midline. On palpation the upper and lateral limits of the tumour can be located but it is usually found impossible to identify the lower pole of the tumour except in the case of relatively small cysts with a long pedicle. The surface of the tumour is smooth, although it may be slightly bossed with multilocular cysts. Small cysts are usually movable from side to side, but large tumours filling the abdomen and tumours which have burrowed extraperitoneally are fixed. The consistence of the tumour is tense and cystic and a fluid thrill can be elicited. Sometimes a cyst is flaccid, when a well marked fluid thrill is obtained, and when the tumour has not the tense consistence of a typical ovarian cyst. It is not uncommon for hard areas to be palpated even with large ovarian cysts. These areas in the case of pseudomucinous cystadenomata are composed of small loculi which give the tumour an almost solid feeling on palpation. With dermoid cysts bone and teeth give a similar *feeling on palpation*, although it is rare for dermoid cysts to lead to large abdominal swellings. All cases of ovarian cyst should be examined carefully for ascites, for the presence of ascites is strong evidence that the tumour is malignant. From time to time, however, well marked ascites is met with in cases of ovarian fibromata. On auscultation an ovarian tumour is dumb. The legs should be examined for œdema. Bilateral œdema is present with large innocent tumours which cause

severe intra-abdominal pressure. Œdema of the feet and, particularly, unilateral œdema is also found with malignant tumours, when secondary deposits compress the iliac veins.

The physical signs found on bimanual examination differ according to the size of the tumour. With small tumours the uterus can be identified without difficulty, and the ovarian cyst can be outlined bimanually, so that the whole of the surface of the cyst can be palpated. The cyst usually displaces the uterus to the opposite side if it extends into the pelvis. With large cysts it may be difficult to outline the uterus, and pressure upon the abdominal swelling may cause the cervix to descend into the vagina. Even with large cysts the lower pole of the tumour should be palpated, either through the anterior fornix or through the posterior fornix. The firm rounded lower pole of the tumour has a characteristic feel, and fluctuation can usually be obtained between the fingers placed in the vagina and the external hand. It is important to identify the position of the uterus if possible, for mistakes in diagnosis with innocent ovarian cysts are almost always due to failure to identify the body of the uterus separate from the tumour. The physical signs of an ovarian cyst may be simulated very closely by a cystically degenerate myoma, and the diagnosis cannot be made with accuracy unless the position of the body of the uterus is established. In all cases the pouch of Douglas should be examined carefully during the pelvic examination, for the presence of

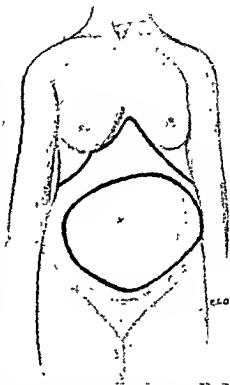


FIG. 259. Ovarian cyst. This tumour lies fairly symmetrically in the abdomen, a little more on one side than on the other. The upper border is defined below the costal margin and there is no displacement of the thoracic viscera. (Menge Opitz.)

hard nodules in Douglas's pouch is strong evidence that the tumour is malignant

Differential Diagnosis

The abdominal physical signs of an ovarian cyst may be simulated by a full bladder, a pregnant uterus, a myoma, and

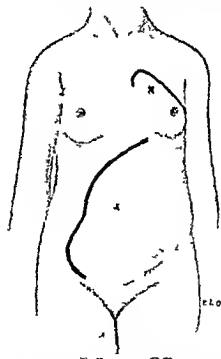


FIG. 260 Hydronephrosis. The tumour lies to one side of the midline. It passes upwards to the level of the costal margin of that side and there is bulging in the left flank. The cross indicates the position of the apex beat in the third space while the black line over the thorax represents the upper limit of cardiac dullness (After Menge Opitz.)

ascites. A full bladder is tense and tender, fixed in position, projecting anteriorly more than an ovarian cyst, and a catheter should be passed to establish the diagnosis.

A pregnant uterus should always be thought of whenever a tumour is found arising from the pelvis. Its exclusion offers no difficulty with appropriate investigations such as X-rays

and the Zondek Aschheim test, if it is thought of. Mistakes are made because the possibility is not considered.

A myoma is usually hard and firm, without the tense cystic consistence of the typical ovarian cyst. Bimanual examination should establish that the tumour is continuous and movable with the cervix, see also p 115.

There is sometimes great difficulty in distinguishing between a large ovarian cyst and ascites. With a large ovarian cyst the percussion note over the tumour is dull whereas both flanks are resistant. In ascites the note is dull over the flanks, while the abdomen is tympanitic in the midline and, moreover, the physical signs of shifting dullness may be obtained. Large veins are often present in the skin of the abdomen in cases of ascites, but such veins are not uncommon with large ovarian cysts. Even with large ovarian cysts the lateral borders of the tumour may be palpable and the tumour may have some degree of mobility.

The most difficult cases are those suspected of tuberculous peritonitis with ascites, when it may be impossible to establish the diagnosis without laparotomy. Encysted ascites of the tuberculous form may be difficult to distinguish from an ovarian cyst, for the encysted fluid lies in the pelvis and projects into the abdomen to form an abdominal tumour. In most cases of tuberculous peritonitis the patient is wasted, with pyrexia and night sweats, and there may be other signs of tubercle in the body.

Difficulty is sometimes experienced by students in distinguishing between an obese abdomen and an ovarian cyst. Some women of menopausal age put on weight very quickly and come up for medical advice complaining of what they term an abdominal tumour. Not infrequently the abdomen is markedly prominent and held rigid. The surest method of excluding an ovarian cyst is to percuss the abdomen below the level of the umbilicus. If the note is tympanitic an ovarian cyst can be excluded although the signs elicited by palpation may be indeterminate.

Other tumours may cause difficulty in diagnosis, for example, a large hydronephrosis may project forwards into the abdomen. Such a tumour always penetrates back into the loin and is situated high up in the abdomen, well above the pelvis. Investigations with uroselectan and ureteric catheterisation will establish the diagnosis. Tumours such as enlarged spleens,

hydatid cysts, and pancreatic cysts are unusual, but they should always be considered if the physical signs of an ovarian cyst are atypical

Small ovarian cysts which lie in the pelvis are usually palpated without much difficulty. They are movable, with a tense consistence and a smooth rounded surface. It may be difficult to establish the diagnosis with accuracy if the tumour is fixed, when such conditions as ectopic gestation, hydrosalpinx, and pyosalpinx have to be excluded. One of the most important points to bear in mind in the consideration of the differential diagnosis is the tendency for innocent ovarian tumours to be free of symptoms

The Clinical Features of Malignant Ovarian Tumours

It is important to establish whether the ovarian tumour is innocent or malignant prior to operation. Most malignant ovarian tumours arise in women of menopausal or post menopausal age. Malignant tumours which arise in younger women are of rapid growth and cause well marked cachexia.

Malignant ovarian tumours almost always lead to fairly severe abdominal pain, and the symptom of pain is much more pronounced than with innocent tumours. In women of post menopausal age, vaginal bleeding may be complained of, and this symptom is typical of granulosa cell tumours, and Brenner tumours particularly. With bilateral malignant ovarian tumours in women under menopausal age amenorrhoea is sometimes complained of in advanced cases. Nevertheless, amenorrhoea is a rare symptom even when both ovaries are completely replaced by carcinoma.

In most cases the condition is bilateral so that two tumours are found, the incidence of bilateral tumours with malignant growths being far higher than with innocent tumours.

Perhaps the most important clinical sign of malignancy is the development of ascites, and in all cases of ovarian tumour careful examination should be made for the physical signs of ascites. In advanced cases secondary deposits in the omentum can be palpated in the upper abdomen. The pouch of Douglas should be carefully examined for nodules, and, if hard, fixed nodules about $\frac{1}{2}$ in diameter are felt through the posterior vaginal fornix, it is almost conclusive that the tumour is malignant. With late cases, extreme cachexia develops, and such complica-

tions as unilateral oedema, pleuritic effusion, and even involvement of lymphatic glands in the left supraclavicular fossa may be found.

Post-menopausal Bleeding with Ovarian Tumours. Post-menopausal bleeding is a characteristic symptom with granulosa cell tumours and Brenner tumours of the ovary. Uterine hæmorrhage may also develop in cases of malignant ovarian tumours which are not of this type, and occasionally innocent tumours such as pseudomucinous cystadenomata and fibromata lead to uterine bleeding. Again, the association of carcinoma of the body of the uterus with a malignant ovarian tumour is not unusual, and this possibility should be borne in mind in cases of this type. Unless the uterus has been previously curetted and a carcinoma of the body excluded, the uterus should always be removed together with the ovarian tumours.

Treatment of Ovarian Tumours

Treatment of ovarian tumours is surgical except in the case of obviously inoperable malignant growths. The operation for removal of an ovarian tumour, called ovariotomy, is performed through the abdomen under general anæsthesia. A paramedian

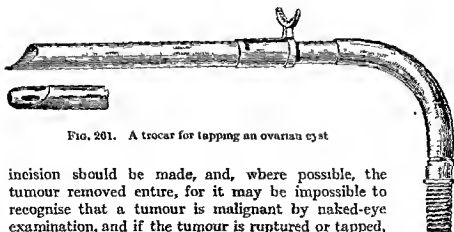


FIG. 201. A trocar for tapping an ovarian cyst

incision should be made, and, where possible, the tumour removed entire, for it may be impossible to recognise that a tumour is malignant by naked-eye examination, and if the tumour is ruptured or tapped, malignant cells may be scattered over the peritoneum.

With mammoth tumours and in the case of large tumours in aged and enfeebled women, the tumour should be tapped immediately the abdomen has been opened so that the tumour can be drawn through a relatively small incision. Moreover, it is very rare for a mammoth tumour to be malignant. After

the tumour has been drawn through the abdominal incision the pedicle is clamped. The pedicle of an ovarian cyst consists of the infundibulo pelvic fold laterally, either the mesovarium or broad ligament in the middle, while at the uterine end are found the ovarian ligament and the isthmus portion of the Fallopian tube. Except in the case of small tumours the Fallopian tube is stretched over the surface of the tumour and

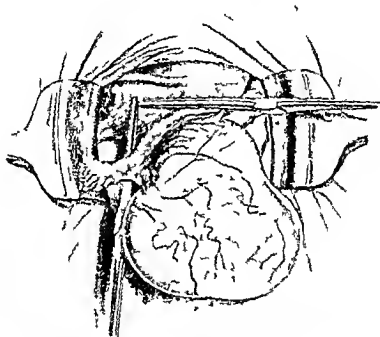


FIG 262 Ovariectomy. The removal of an ovarian cyst of the left side. The clamp on the left has been placed on the infundibulo-pelvic ligament. The clamp on the right encloses the ovarian ligament, the Fallopian tube and part of the broad ligament. (Peham Amreich.)

has to be removed at operation. It is best to place three clamps on the pedicle: one on the infundibulo pelvic fold, one on the broad ligament, and the third on the ovarian ligament and isthmus portion of the Fallopian tube. With large tumours huge veins traverse the pedicle, and it is best to duplicate the clamps before excising the tumour. The pedicle is put on the stretch after the tumour has been pulled out of the abdomen and unless the veins are securely clamped they may retract away

from the clamp and cause retroperitoneal bleeding which may be difficult to control. The pedicle is then transfixed and ligated and covered with a peritoneal flap dissected away from the lateral wall of the pelvis and the abdomen closed in the usual way.

In most cases the operation is extremely simple to perform, but if the tumour has burrowed extraperitoneally great difficulty

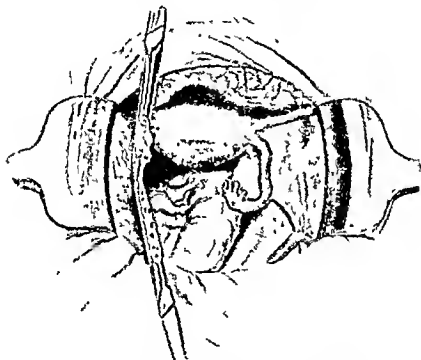


FIG. 263. The pedicle which is left after the removal of a large ovarian cyst (Peham-Amreich.)

may be experienced in its removal, for it must be shelled out, and there is a grave risk of damage to the ureter.

Shock is a very rare complication of the removal of large innocent tumours, patients being unaffected by the sudden release in abdominal pressure. On the other hand, in cases of malignant ovarian tumours complicated by ascites, the sudden release of pressure may lead to profound shock and collapse. The after-treatment of ovariectomy cases is similar to that outlined in Chapter XX in the description of the operation of hysterectomy. The particular complication of ovariectomy is reactionary hæmorrhage from the pedicle leading to either

intraperitoneal bleeding or an extraperitoneal hæmatoma. Adhesions to the pedicle with subsequent intestinal obstruction should be regarded as the results of bad technique, for large pedicles should always be covered either by the sigmoid colon or by a peritoneal flap dissected away from the lateral wall of the pelvis.

The treatment of malignant ovarian tumours is surgical where possible. Statistics show that the best results are obtained after removal of both ovaries and the uterus. The removal of malignant ovarian tumours may be extremely difficult, for the growth may become adherent to surrounding structures, so that the tumours and the uterus may be firmly fixed in the pelvis. All cases of malignant ovarian tumours should be treated by deep X rays subsequent to the operation to destroy metastatic carcinoma in the pelvis.

The treatment of inoperable malignant ovarian tumours is unsatisfactory, particularly if there is well marked ascites or if metastases are disseminated over the peritoneum and the omentum.

CHAPTER XXV

INFLAMMATIONS OF THE UTERINE ADNEXA INFLAMMATIONS OF THE FALLOPIAN TUBES AND OVARIES SALPINGO-OÖPHORITIS

Introduction

THE majority of inflammations of the Fallopian tubes and ovaries are the result of ascending infections and are best represented by gonococcal salpingo oophoritis and the adnexal inflammations which complicate septic abortion and puerperal sepsis. In acute infections, the inflammation, though mainly affecting the Fallopian tube, almost always involves the ovary coincidentally. Similarly, the end results of acute adnexal infections lead to changes in both the Fallopian tubes and the ovaries. It is customary, therefore, to consider inflammations of the tubes and ovaries together, rather than to deal with each organ separately. Indeed, apart from some cases of mumps, it is very doubtful if an ovarian inflammation ever arises independently of a coincident inflammation of the corresponding Fallopian tube.

Ætiology

There is a natural barrier to the migration of bacteria from the vagina to the endometrium of the body of the uterus and to the Fallopian tubes. The acidity of the vagina inhibits the growth of pyogenic organisms which may enter the vagina through the introitus. Also the cervical canal has a relatively small lumen which is normally filled by a plug of mucus. Again the ciliary movement in the uterus and cervical canal is directed downwards and prevents the spread of non motile organisms to the cavity of the uterus. This natural protective mechanism becomes impaired during menstruation and after abortion and child birth, for the cervical canal becomes dilated, the protecting epithelium of the endometrium is shed, and raw surfaces are left in the cavity of the uterus. Further, alterations in the acidity of the vaginal contents lead to a more favourable environment for the growth of pyogenic bacteria. Moreover, after abortion

and child birth the puerperal uterus is undergoing involution and the resistance of its tissues to infection is probably lower than at any other time. It is well known clinically that the majority of uterine and adnexal infections arise after either abortion or child birth, while gonococcal salpingo oophoritis almost always arises immediately after menstruation.

In addition to the factors already mentioned, direct infection of the cavity of the uterus is brought about by intra uterine manipulations during child birth, by the evacuation of retained products after abortion, by operations for induced abortion, and by such intra uterine manipulations as curetting and removal of myomatous polypi.

Upward spread of infection to the Fallopian tube is by way of the mucous membrane, and it is usually possible to demonstrate in the examination of material removed, an endometritis, an endosalpingitis of the interstitial portion of the Fallopian tube, and lastly an endosalpingitis involving the isthmus and ampullary parts of the tube. With virulent infections the inflammation spreads to the pelvic peritoneum, and as the result of suppurative pelvic peritonitis an abscess may form in Douglas's pouch.

Although ascending infections comprise the majority of cases of adnexal inflammation, the uterine appendages may be infected by direct spread from the peritoneal cavity. In appendicitis, particularly when the appendix is lying in the pelvic position, the right adnexa may become involved by direct spread, and from time to time salpingo oophoritis complicates diverticulitis of the sigmoid colon. Other forms of peritonitis may lead to inflammations of the adnexa, and in almost any type of general peritonitis the outer surfaces of the Fallopian tubes and ovaries are infected.

Blood stream infections are seen from time to time. In tuberculosis of the Fallopian tubes two forms are recognised perisalpingitis, when the tubes are involved by infection from the peritoneal cavity, and endosalpingitis, when the infection is by way of the blood stream. Blood stream infections arise from time to time as the result of the acute specific fevers, but such cases are rare.

The organisms which cause the infection are the gonococcus, the streptococcus hæmolyticus, the streptococcus faecalis, and the bacillus coli communis. Infections with other organisms, apart from the tubercle bacillus, are very rare.

Pathological Anatomy

Acute Salpingitis. In acute salpingitis the Fallopian tube is swollen, cedematous, and hyperæmic with visible dilated vessels on the peritoneal surface. In all cases there is some degree of serous exudation in the peritoneal cavity around the Fallopian tube. One of the most important signs of acute salpingitis is the discharge of sero-purulent fluid from the abdominal ostium of the tube. This sign is of the greatest importance at laparotomy, for visual examination of the Fallopian tubes in an obscure case of peritonitis may disclose signs of inflammation of the peritoneal surface of the tube, but there is no justification for

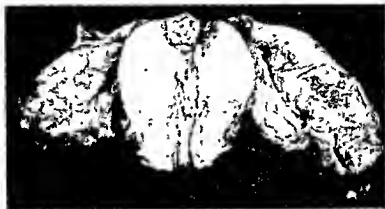


FIG. 264. The uterus and appendages from a case of bilateral salpingo-oöphoritis.

diagnosing the case as one of primary salpingitis unless sero-purulent fluid can be seen being discharged from the abdominal ostium. The peritoneal surfaces of the Fallopian tubes may be inflamed in any form of peritonitis which leads to a pelvic peritonitis. In acute salpingitis the fimbriæ around the abdominal ostium are swollen and cedematous and covered with exudate.

If the tube is removed and examined microscopically, in ascending infections the plicæ are swollen and cedematous, infiltrated with leucocytes and plasma cells, and the capillaries are dilated. Round-celled infiltration spreads into the muscle and subserous layer in severe cases. As the result of the round-celled infiltration of the plicæ there is an exudation of leucocytes into the lumen of the tube. Moreover, the epithelial cells covering the plicæ become desquamated in places, so that

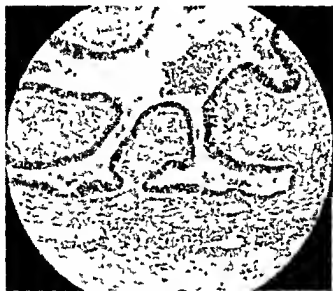


FIG. 243. Suppurative acute salpingitis. The plicae of the tube are redematous. The stroma (el) is infiltrated with round cells. Pus cells lie in the lumen of the tube.



FIG. 244. Acute suppurative salpingitis showing the tubal plicae infiltrated with inflammatory cells with desquamation of the surface epithelium and a transudation of inflammatory cells into the lumen of the tube.

inflammatory exudation is discharged directly into the lumen of the tube. In the process of healing adjacent pieces become adherent where the surface epithelium has been shed, so that crypts and pockets are formed in the Fallopian tube which may subsequently be the cause of ectopic gestation.

Two forms of acute salpingitis are recognised, namely the catarrhal and the suppurative. The catarrhal cases comprise those of moderate severity when pus formation in the lumen of the tube is of a minor degree. With suppurative cases the infection is intense, and pus either accumulates in the lumen of the tube or is discharged through the abdominal ostium into the peritoneal cavity and lights up pelvic peritonitis. Gangrenous acute salpingitis is unknown because the Fallopian tube is supplied with blood both from the uterine end by way of the tubal branch of the uterine artery, and at the fimbriated extremity and along its whole length by branches from the ovarian artery.

In the majority of cases both adnexa are affected simultaneously, for the Fallopian tubes lie symmetrically with respect to the uterus and with ascending infections there is no reason why one tube should be infected rather than the other. Unilateral salpingo oophoritis is, however, seen from time to time as the result of either appendicitis or diverticulitis, and sometimes also in puerperal cases.

In the acute stage the ovary is infected simultaneously with the Fallopian tube, partly from direct infection of its peritoneal surface and partly from lymphatic spread by way of the lymphatics of the mesosalpinx and mesovarium. With catarrhal salpingitis the ovary becomes swollen, vascular and oedematous. Its peritoneal surface is first covered by exudate and subsequently surrounded by adhesions. The Graafian follicles become larger than normal. In suppurative salpingitis small abscesses may develop in the substance of the ovary, and they are particularly apt to form in ripening follicles and in young corpora lutea. The end result of such multiple abscesses is either the formation of an enlarged ovary studded with abscesses of this kind, or the abscesses may fuse with a pyosalpinx to form a tubo-ovarian abscess. Some ovarian abscesses are lined by ragged yellow tissue and are regarded as corpus luteum abscesses. The yellow tissue often consists mainly of pseudo-lutein cells and it is not established definitely that all such abscesses are formed in a corpus luteum.

In a large number of cases of acute salpingitis the abdominal ostium becomes closed and the mechanism of its closure is not fully understood. With acute suppurative salpingitis the plicæ around the abdominal ostium become cedematous, so that the lumen of the tube is much reduced in size in the vicinity of the abdominal ostium, and there is a tendency for the purulent exudation to accumulate in the lumen of the tube. Moreover, the intense inflammation around the fimbriated extremity causes an exudation which leads to adhesions and these adhesions close the outer end of the Fallopian tube. The interstitial portion of the tube becomes closed by the œdema of the mucous membrane so that finally the tube becomes distended with pus, forming a pyosalpinx. The most distensible part of the tube is the ampullary region, which is also the most movable. In consequence the outer part of the tube becomes more distended than the isthmus region and falls downwards behind the broad ligament and becomes adherent both to the back of the uterus and to the posterior surface of Douglas's pouch. The shape of the distended tube therefore becomes similar to that of a retort. An acute pyosalpinx of this kind is surrounded by adhesions which fix it to the back of the broad ligament, the ovary, the sigmoid colon and the posterior surface of Douglas's pouch. The wall is thickened and the tube is tense with the pent up fluid.

In all cases of acute salpingitis there is some degree of inflammation of the pelvic peritoneum and even with mild cases free serous fluid is found in the pelvis. With virulent infections pus forms in the pelvis partly as a result of the inflammation of the peritoneum itself but also from the discharge of pus from the abdominal ostium of the infected tube. Fairly large collections of pus may accumulate in Douglas's pouch and can be detected by vaginal examination through the posterior fornix. Such pelvic abscesses sometimes discharge themselves into the rectum.

End-Results of Adnexal Inflammation Although acute adnexal inflammation is frequently of an extremely severe degree a spreading general peritonitis is a very uncommon complication except with streptococcal infections developing after abortion or during the puerperium. The pelvic peritoneum forms the lowest part of the peritoneal cavity and not only is it highly probable that the pelvic peritoneum has a high resistance to infection but its situation helps to localise the

infection From time to time, however, even low grade infections with the gonococcus lead to a spreading general peritonitis In most cases of acute adnexal inflammation it is customary to treat the case conservatively until the infection is strictly limited to the pelvis, and if by then an abscess has formed, it can be drained without much risk of contamination of the general peritoneal cavity

In many cases of acute adnexal inflammations there is no subsequent abscess formation in the pelvis so that operation is unnecessary, but even with mild catarrhal cases there is always permanent damage to the tubes and ovaries This may take the form of membranous adhesions surrounding the Fallopian tube, which may lead to sterility, or the tubal plicæ may become adherent and, by the formation of pockets, may be responsible for the subsequent development of ectopic gestation If a pyosalpinx or tubovarian abscess has formed during the acute stage the active inflammation subsides, and it has been shown by Curtis that in gonococcal cases the pus contained in such abscesses becomes sterile within six weeks of the initial attack

It is customary to classify chronic salpingo oophoritis as follows

Hydrosalpinx.

Pyosalpinx

Chronic interstitial salpingitis

Tubovarian cyst and tubovarian abscess

The tuberculous forms

In hydrosalpinx both ends of the Fallopian tubes are closed and the tube is distended with clear fluid A hydrosalpinx is always covered by membranous adhesions which fix it to the ovary and to the pelvic peritoneum The wall is thin and the tubal plicæ are flattened out. The uterine end of the Fallopian tube is closed from adhesion of the plicæ, while in the region of the abdominal ostium the fimbriæ are indrawn so that the outer surface of the hydrosalpinx is smooth and rounded The abdominal ostium is probably closed by adhesions around the fimbriæ, so that the wall of a hydrosalpinx in this situation consists of these adhesions and not of the muscle wall of the tube A hydrosalpinx is retort shaped and it may form a tumour as much as six inches in diameter The condition is not infrequently bilateral A hydrosalpinx must be distinguished from a fimbrial cyst A hydrosalpinx represents



FIG. 267. A large tuberculous pyosalpinx. The ampullary end of the Fallopian tube is closed and lies below and to the left. The cut uterine end lies above. The pyosalpinx is covered with miliary tubercles.

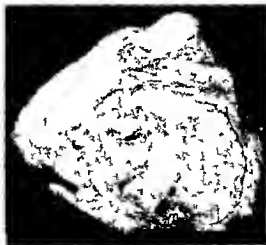


FIG. 268. A tubovarian cyst. The Fallopian tube lies above and to the left while the ovarian cyst lies below towards the right. Below and to the left a dark cannula passes between the Fallopian tube and the cyst in the ovary. The uterine end of the tube lies above to the right.

a retention cyst of the Fallopian tube, it is not associated with active inflammation but represents the end results of a

previous catarrhal salpingitis. The condition of hydrops tubæ profluens, or intermittent hydrosalpinx, when the tube intermittently discharges its contents into the uterus, has been described.

A chronic pyosalpinx, on the other hand, is thick-walled, surrounded by dense adhesions and filled with pus. The inner wall is replaced in part by granulation tissue.

In chronic interstitial salpingitis the wall of the Fallopian tube is thickened and fibrosed, and there may be small collections of pus either in the muscle wall or beneath the peritoneum, but there is no accumulation of pus in the lumen of the tube.

In tubovarian cyst a hydrosalpinx communicates with a follicular cyst of the ovary, while with tubovarian abscess a pyosalpinx communicates with an ovarian abscess. In both types of case it is usually difficult to identify normal ovarian tissue in any part of the swelling.

The tuberculous forms have already been described in Chapter VI.

Symptoms and Diagnosis

The onset of acute salpingo-oophoritis is marked by the development of abdominal pain. The pain is situated in the lower abdomen below the umbilicus, and as both tubes are usually infected simultaneously the pain is bilateral. The pain is of a severe degree and is induced partly by inflammation of the pelvic peritoneum and partly by distension of the Fallopian tubes and ovaries. The pain can be distinguished from that of acute appendicitis because there is never a history of diffuse abdominal pain subsequently localised to the right iliac fossa. Fever is often well marked, the temperature rising to 103° or 104° F. The pulse rate is raised and in severe cases may be as high as 120. Nausea and vomiting are not so characteristic as in appendicitis, but in severe cases a history of vomiting can usually be obtained.

Menstrual irregularities are extremely common, particularly in the acute stage. With ascending infections an endometritis precedes the inflammations of the adnexa, so that the menstrual period is profuse and prolonged. Again, in acute salpingo-oophoritis ripening follicles are apt to become much larger than normal, and perhaps for this reason patients develop uterine bleeding at times when a menstrual period is not expected, and this uterine bleeding is often profuse and pro-

longed. These menstrual irregularities are extremely common in adnexal inflammations and may cause great difficulty in diagnosis, for prolonged uterine bleeding is a feature of ectopic gestation.

Some degree of vaginal discharge is always present if the infection is ascending in type. The discharge may be caused by gonorrhœa or it may be the infected lochia of septic abortion or puerperal sepsis. Vaginal discharge is always present in cases of the ascending type. It follows that the case should be investigated carefully for a vaginal discharge before the diagnosis of adnexal inflammation is made.

Clinical experience shows that it is of great importance to obtain an accurate history before the diagnosis of adnexal inflammation can be made with accuracy. A history of recent delivery or of abortion will direct attention towards the pelvis. Adnexal inflammations usually arise about the tenth day after delivery in cases of puerperal sepsis and similarly in septic abortion the symptoms and signs of salpingo-oophoritis become evident during the 2nd week. Salpingo oophoritis is very apt to complicate abortion if retained products of conception have become infected. If gonorrhœa complicates pregnancy the patient is apt to develop gonococcal salpingo oophoritis during the 2nd week after delivery. Sometimes there is difficulty in obtaining an accurate history. For example, in cases of illegal abortion patients are often reluctant to admit that they have been pregnant, and may give a menstrual history which is deliberately inaccurate.

In gonorrhœa a history of vaginal discharge associated with scalding micturition and vulvitis may be elicited.

Physical examination of the abdomen shows the signs of distension combined with tenderness and rigidity below the level of the umbilicus. It is relatively rare for an abdominal tumour to be palpated in cases of acute salpingo-oophoritis. At a later stage, if a large pelvic abscess develops or if large pyosalpinges form, a tender fixed abdominal tumour may be palpated arising from the pelvis. On vaginal examination, in ascending infections a purulent vaginal discharge is always present and the cervix should be examined with a speculum to demonstrate that the discharge emanates from the cervical canal. The patient is then examined bimanually, and the physical signs vary according to the type of case. In mild cases the uterus can be identified. Swollen tender appendages can be

palpated lateral to the uterus. The swollen appendages always tend to be prolapsed behind the uterus so that their lower borders can be felt in Douglas's pouch through the posterior fornix. If the patient is easy to examine the retort shape of the pyosalpinx can be recognised. If, however, much abdominal tenderness and rigidity are present an accurate bimanual examination may be impossible. Vaginal examination, however, will always demonstrate the indurated lower parts of the appendages in Douglas's pouch. If a pelvic abscess has formed, pus accumulates in Douglas's pouch to form an indurated swelling with softening in the middle. A large abscess produces bulging of the posterior vaginal wall, and the fluctuating swelling can also be identified by rectal examination.

Chronic Salpingo-oöphoritis. The symptoms of chronic salpingo oophoritis are often indefinite. The main complaint is vague pain located to the lower abdomen associated with chronic backache. Vaginal discharge is a constant symptom and is caused not by an intermittent discharge of pus through the interstitial portion of the tube into the uterus, but by an associated chronic cervicitis. The menstrual periods are apt to be excessive and sometimes the menstrual rhythm is irregular. Most patients complain of dyspareunia because the swollen appendages are prolapsed behind the uterus and form tender swellings in Douglas's pouch. Sterility may also be complained of and there is sometimes a history of congestive dysmenorrhœa. If extensive adhesions have formed in the pelvis the patient may complain of vague pains in the abdomen related to distension of the rectum and bladder. The chronic symptoms of patients suffering from chronic salpingo oophoritis react upon the general health so that the patients become depressed and show constitutional disturbances.

Recurrent attacks of acute inflammation are seen from time to time in cases of chronic salpingo oophoritis. Mostly they are due to reinfection with the gonococcus. Such attacks should be distinguished from recurrent ovarian pain, which is not uncommon and is caused by the development of large ripening follicles in the ovaries.

Pelvic examination in chronic cases is always easier than in the acute stage of the disease. The appendages are found to be tender, thickened and fixed. With hydrosalpinx and pyosalpinx the typical retort shape can be distinguished and the position of the swelling with its lower pole attached to the

back of the uterus is characteristic. A hydrosalpinx is tense, thin walled, and fixed, whereas a fimbrial cyst is more movable, and not so tense. A pyosalpinx is often hard and firm and may be mistaken for a myoma. Fixity is an important sign in chronic adnexal inflammation, for it indicates the presence of adhesions.

Differential Diagnosis

Acute Cases It is important to distinguish between acute appendicitis and acute adnexal inflammation. In appendicitis the abdominal pain, first diffused around the umbilicus subsequently becomes located to the right iliac fossa, whereas in acute salpingo oophoritis the pain is from the first in the lower abdomen and situated on each side of the midline. In appendicitis tenderness and rigidity are localised to the right iliac fossa except when general peritonitis has developed. With appendix abscess a tumour can be felt in the iliac fossa and it is usually possible to palpate below the level of the swelling. In acute adnexal inflammations tenderness and rigidity are present on both sides of the midline, and except with large pelvic abscesses it is unusual for an abdominal swelling to be found. Distension is commonly present, however, even with localised pelvic peritonitis. The distinction between the two conditions is established by pelvic examination. In acute salpingo oophoritis a purulent vaginal discharge is present and the swollen cedematous Fallopian tubes should be palpated in Douglas's pouch.

There is often difficulty in distinguishing between ectopic gestation and acute salpingo oophoritis, for in both cases there is a history of severe abdominal pain associated with the presence of a swelling in the pelvis. Moreover, in acute salpingo oophoritis patients frequently suffer from continuous uterine bleeding. Another difficulty is that salpingo oophoritis may complicate illegal abortion and a history of a missed period may be obtained. In adnexal inflammations there is always some degree of pyrexia whereas in ectopic gestation a temperature above 100° is hardly ever seen. Again, in salpingo oophoritis the signs are those of an infection so that the patient has a furred tongue, the abdominal tenderness is intense, and there is well marked leucocytosis.

Diverticulitis may present a clinical picture very similar to that of acute salpingo-oophoritis. The condition, however,

usually arises in women about the age of fifty, and the abdominal signs and pelvic swelling are limited to the left side. It may be possible to move the uterus independently of the pelvic tumour. A barium enema examination by X rays will establish the diagnosis.

A twisted ovarian cyst usually forms an abdominal tumour, although small cysts are sometimes restricted to the pelvis.

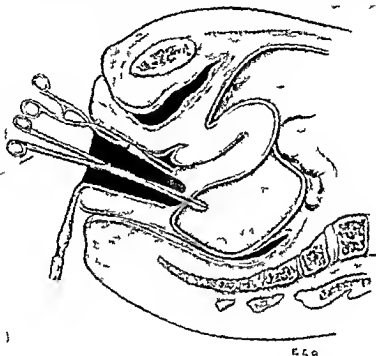


FIG. 69. Evacuation of a pelvic abscess by posterior colpotomy. The posterior lip of the cervix is drawn forwards, the posterior vaginal wall is retracted backwards, and the pus evacuated by Hilton's method. (After Stoeckel.)

A twisted cyst is not accompanied by severe pyrexia or by vaginal discharge, and the outline of the tumour is circumscribed.

Chronic Cases. The physical signs found in chronic salpingo-oophoritis are usually elicited without difficulty, but are not always easy to interpret. Ectopic gestation and diverticulitis present rather similar pictures, and myomata and ovarian cysts may also give rise to difficulty. In chronic salpingo-oophoritis the swellings are usually bilateral, tender and fixed, and the history obtained is of the greatest importance in establishing the diagnosis.

Treatment

Acute Cases The treatment of acute salpingo oöphoritis should be conservative, except when it is complicated by spreading general peritonitis or by abscess formation, when surgical treatment becomes necessary

If surgical intervention is undertaken in acute salpingo oophoritis, when the infection is localised to the pelvis, and the abdomen is opened, manipulation of the pelvic organs may be followed by spread of infection to the rest of the peritoneum, and a fatal general peritonitis may be lighted up. Secondly, surgical intervention by the abdominal route is unsound in principle unless the source of infection is removed, and this, in the average case, would necessitate not only the removal of both Fallopian tubes but also excision of both ovaries as the ovaries are almost always simultaneously infected. Such drastic procedure is to be condemned. Simple drainage of the pelvis by laparotomy with conservation of the adnexa is unnecessary, for the pelvic peritoneum is capable of dealing with the infection in the average case, and even if a pelvic abscess develops it may point in the pouch of Douglas, when it can be evacuated through the posterior vaginal wall. Perhaps the most important point in the consideration of the treatment of acute salpingo oophoritis is that it is exceptional for the infection to involve the general peritoneal cavity, so that conservative treatment can be undertaken with confidence with small risk of an acute general peritonitis developing.

Conservative Treatment The diagnosis must be made with precision before conservative therapy is undertaken, and it is particularly important to exclude appendicitis.

As in all inflammations the first essential is complete rest. The patient is kept in bed and placed in Fowler's position. Purgation must be avoided in the early stages and the bowels should be emptied with enemata. Hot applications, such as antiphlogiston or hot fomentations should be employed on the lower abdomen. Heat should be applied to the pelvis by means of hot vaginal douches. For this treatment the patient should be placed on her back with the pelvis raised on a bedpan and hot vaginal irrigations at a temperature of about 110°-115° F should be given. The solution should consist either of saline or of a weak antiseptic. The object of the irrigation is to apply heat to the pelvis, not to use antiseptics to the vaginal walls.

The treatment should be carried out four hourly and the nurse should spend at least twenty minutes over the douche, and the solution should be run in very slowly

The abdominal pain can be relieved by the administration of such drugs as aspirin, pyramidon, allonal, and veramon. The opium derivatives should be used with caution, particularly if there is any doubt as to the diagnosis

Chemotherapy has revolutionised the treatment of acute salpingitis. The cases respond at once to full doses of sulphapyridine and sulphanilamide. In gonococcal cases sulphapyridine is to be preferred to sulphanilamide. Clinical experience shows that chemotherapy gives extremely good results and the necessity for immediate or late surgical intervention has been much reduced

The majority of acute cases respond extremely well to conservative therapy of this kind and it is remarkable how large swellings retrogress. Unless an abscess forms in the pelvis the patient is usually relieved of symptoms and is able to get up in fourteen days after the treatment has been adopted

In cases of pelvic abscess the abscess usually points in Douglas's pouch and may empty itself spontaneously by bursting into the rectum and the end result in such cases is extremely good. It is better, however, to drain the abscess by the operation of posterior colpotomy, which consists in the incision of the posterior vaginal wall immediately posterior to the cervix and the evacuation of the pus by Hilton's method. A piece of corrugated rubber is pushed into the abscess cavity and sutured with catgut to the margins of the incision in the vaginal wall. It is unsatisfactory, however, to drain a pyosalpinx by the vaginal route, and care must be taken to ensure that the swelling in Douglas's pouch is a collection of pus lying free in the peritoneal cavity and not the lower pole of the large pyosalpinx

If the acute salpingo oophoritis leads to the formation of a pyosalpinx the pyosalpinx must be removed by abdominal operation. The best results are obtained if the case is treated conservatively for about a fortnight, for by that time the infection becomes strictly limited to the pelvis and the risk of spread to the general peritoneal cavity is small. The operation is often extremely difficult because the Fallopian tubes are adherent to the back of the uterus and to the broad ligament, and the omentum and intestines may also be fixed firmly by adhesions. After the abdomen has been opened the intestines

are packed away with swabs soaked in warm saline solution and the omentum and intestines are separated from the tubal swellings. The distended Fallopian tube together with the ovary in cases of tubovarian abscess are then separated from the back of the uterus and the operator should effect the separation by starting from below and working upwards. The affected appendages are then excised and the pedicles tied with strong catgut. It is best to drain the pelvis with rubber sheeting for a few days. Some surgeons prefer to remove the uterus if the adnexa of both sides have to be removed. Except for cases of septic abortion, hysterectomy is unnecessary, for good results are obtained if the uterus is left behind.

Chronic Cases In chronic salpingo oophoritis, if the patient has either a pyosalpinx or a hydrosalpinx surgical treatment is clearly indicated. In all other cases conservative treatment should first be adopted.

The usual procedure with the conservative treatment of chronic salpingo oophoritis is to give the patient a course of hot vaginal douches combined with rest in bed and chemotherapy. Treatment with tampons is also of value. A tampon consists of a pledget of wool soaked in a hygroscopic antiseptic solution such as 20 per cent ichthyol in glycerine. The tampon is inserted with the help of a Sims speculum in the evening and removed on the following morning. Hot air baths, pelvic diathermy, the injection of foreign protein and spa treatment are very helpful in the treatment of chronic cases.

As in most branches of gynecology, treatment in chronic adnexal disease depends upon the individual case. The term "chronic salpingo oophoritis" is in many ways a misnomer, for apart from chronic pyosalpinx an active inflammation cannot be demonstrated in these cases. Conservative treatment is therefore never of particular value except in the type of case which may best be termed subacute, that is to say, cases of acute salpingo oophoritis which have not received intensive conservative treatment. In gonococcal cases with recurrent infections conservative treatment is also of great value, but with the end results of salpingo oophoritis, represented by hydrosalpinx, adhesions in the pelvis, adherent and tender ovaries, much cannot be expected of conservative measures, and sooner or later such patients must be treated by surgery. Surgical treatment consists in laparotomy with the removal of a hydrosalpinx or pyosalpinx. Thickened Fallopian tubes should

be removed, and ovaries irreparably damaged and adherent must also be sacrificed. In young women some normal ovarian tissue should be retained if possible. If the uterus is retroflexed and bound by adhesions to the posterior surface of Douglas's pouch, it may be necessary to perform ventrisuspension. In this event the omentum should be drawn down behind the uterus, otherwise there is a risk of acute intestinal obstruction developing as the result of intestine becoming adherent to the back of the uterus.

If it has been found necessary to excise both ovaries and the patient is young, some authorities undertake homoio-transplantation, grafting ovarian tissue excised from some other patient.

CHAPTER XXVI

DISEASES OF THE BROAD LIGAMENT, FALLOPIAN TUBES AND PARAMETRIUM

BROAD LIGAMENT CYSTS

BROAD ligament cysts are fairly common. With the exception of fimbrial cysts, they rarely attain more than 1 in in diameter.

Fimbrial Cysts

Fimbrial cysts are extraperitoneal cysts lying in the outer part of the broad ligament lateral to the ovary, below the Fallopian tube, and above the level of the infundibulo pelvic fold of peritoneum. Small fimbrial cysts are extremely common and are often found at operation without their presence having previously been suspected. They may, however, form tumours as large as 12 in in diameter. The cysts are usually unilocular, containing clear fluid, their walls being smooth, thin and translucent. Sometimes three or more loculi are present, and papillomata, similar to the stationary papillomata of papillary cystadenomata of the ovary, may be scattered over the inner surface of the cyst. In such cases pseudo mucin is found in the fluid contents.

Fimbrial cysts are sometimes confused with ovarian cysts at operation. A fimbrial cyst should be identified because the ovary is separate from the cyst and because both the Fallopian tube and the ovarian fimbria are stretched over the convexity of the swelling. Moreover, the cyst is extraperitoneal, and two systems of blood vessels can be recognised in the wall, namely, that belonging to the peritoneum and that of the cyst wall. The nomenclature "fimbrial cyst" is misleading, for the tumours do not arise from the fimbriae of the tube. Their origin is unknown. Keith has suggested that they arise from ovarian remains in the outer part of the broad ligament, but it is more probable that they develop from downgrowths from the peritoneum.

Treatment. Fimbrial cysts must be treated surgically by removal at abdominal operation. The simplest method is first

to tap the cyst and then to shell out the cyst wall from the broad ligament. Very little hæmorrhage is encountered, and this surgical treatment preserves both the ovary and the Fallopian tube.

Broad Ligament Cysts derived from the Wolffian System

The Wolffian system is represented in the broad ligament by Gärtner's duct and the vertical tubules of the epoöphoron, together with Kobelt's tubules which lie lateral to the epoöphoron. Any of these tubules may become cystic, but the

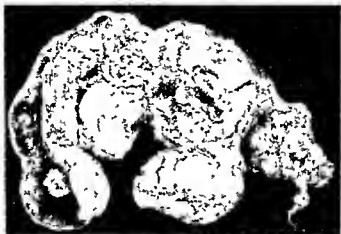


FIG 270. Carcinoma of the Fallopian tube. One Fallopian tube containing papillary growth lies to the left. Between it and the uterus lies the corresponding ovary, while the opposite tube and ovary lie to the right.

cysts never become larger than a cherry. They have no clinical importance, and are found incidentally at operation.

Cyst of the Hydatid of Morgagni

These cysts are of no clinical significance. They take the form of minute cysts attached to one or other tubal fimbria. They have been regarded as pronephric in origin.

It is not uncommon to find small cysts in the region of the broad ligament and Fallopian tube which belong to none of the groups already mentioned. They have no clinical importance, but are of some interest pathologically. Small subperitoneal cysts frequently develop after pelvic peritonitis, and are most common on the peritoneal surface of the tube and the posterior

layer of the broad ligament. Again, in cases of small hydrosalpinx it is not uncommon for mucosal diverticula to become distended with fluid. Very rarely an accessory tube may become distended as the result of closure of its abdominal ostium.

Tumours of the Fallopian Tube

Neoplasms of the Fallopian tube are extremely rare and the only types which need description are the adenocarcinoma and chorion epithelioma.

Adenocarcinoma of the tube usually arises in women of menopausal age, particularly in multiparæ. The earliest



FIG. 271 Carcinoma of the Fallopian tube.

symptom is a characteristic amber-coloured discharge, which is subsequently followed by bleeding. Pain is a very common symptom, and quite frequently the pain is of severe degree. The tumour is an adenocarcinoma composed of villous-like processes, which are surrounded by malignant cells. The tumour is bilateral in about a third of cases and has a high degree of malignancy, giving rise to metastases over the peritoneum and omentum fairly rapidly. The tumours should be regarded as extremely malignant and recurrences are very apt to form after operation, however carefully the tumour is removed. The condition is diagnosed with difficulty, for the clinical picture is similar to that of carcinoma of the ovaries. Operation consists in removal of both tubes, both ovaries, and the uterus.

Chorion epithelioma of the Fallopian tube may arise primarily in the tube as a result of ectopic gestation, or it may form by metastasis from a primary growth of the uterus

Swellings of the Fallopian Tube

The Fallopian tube may become distended with clear serous fluid, forming a hydrosalpinx, or with pus causing a pyosalpinx. Both swellings have already been described in the previous chapter. At other times the Fallopian tube becomes distended with blood, forming a hæmatosalpinx.

A hæmatosalpinx arises most frequently in ectopic gestation, particularly in cases of tubal mole (see p. 304). Hæmatosalpinx is found not uncommonly in the Fallopian tube of the opposite side in cases of ectopic gestation, for regurgitant blood from the uterus into the Fallopian tube is prevented from spreading into the peritoneal cavity by adhesions around the abdominal ostium. A hæmatosalpinx may also develop as the result of vaginal or cervical atresia when menstrual blood accumulates in the uterus and regurgitates back into the Fallopian tube, the abdominal ostium of the tube becoming closed by adhesions. Vaginal atresia is usually due to imperforate hymen, while cervical atresia is usually the result of trachelorrhaphy, or amputation of the cervix. Sometimes a hydrosalpinx undergoes torsion, becomes filled with blood, and gives rise to a hæmatosalpinx.

Affections of the Broad Ligament and Parametrium

Hæmatoma. Hæmatoma of the broad ligament and parametrium may result from an ectopic gestation which ruptures extraperitoneally into the broad ligament. Large hæmatomata develop in consequence of rupture of the uterus or cervix during child birth. They may arise after dilatation of the cervix of an ill developed uterus, when the cervix may split and the uterine vessels be wounded. The condition sometimes develops in cases of concealed accidental hæmorrhage. A broad ligament hæmatoma tends to spread extraperitoneally and may track upwards and cause a swelling above Poupert's ligament, and very exceptionally it may spread to the perinephric region.

Parametritis. Parametritis, first described by Matthews Duncan, is a cellulitis of the tissues of the parametrium. Well marked parametritis almost invariably follows child birth or

abortion, when the parametrium is infected from lacerations of the vaginal portion of the cervix and of the vaginal vault or from lacerations of the lower uterine segment. Some degree of parametritis is present in all acute infections of the uterus and Fallopian tubes, and in advanced cases of carcinoma of the cervix. The cases which are of clinical importance are those complicating child birth and abortion. The condition causes symptoms at the beginning of the 2nd week when the patient complains of pain in the hypogastrium and back. The temperature is raised to about 102°F , the pulse rate being raised in the same proportion. The inflammation of the pelvic cellular tissue leads to the development of a large indurated swelling in the pelvis. In the early stages the uterus is pushed to the opposite side and the indurated swelling of the parametrium extends from the uterus to the lateral wall of the pelvis, and fixes the uterus in the pelvis. It is impossible to separate the uterus from the swelling, for the parametrium extends to the wall of the uterus. The parametritic effusion spreads backwards along the utero sacral ligaments, but it may also track upwards and point above Poupart's ligament lateral to the femoral vessels. On rare occasions the effusion may point in the perinephric region, in the ischio rectal fossa and even in the buttock, having tracked through the sacro sciatic foramen. Suppuration in parametritic effusions is uncommon, and even if the effusion points and has to be incised it is rare for frank pus to be evacuated. As the effusion is extraperitoneal, symptoms of peritoneal irritation are absent, but rectal symptoms may arise as the result of inflammation involving the rectum.

In the majority of cases, parametritic effusions subside under conservative treatment, but they are followed by scarring of the parametrium which causes chronic pelvic pain. Very rarely scarring of the utero sacral ligaments may cause some degree of stenosis of the upper part of the rectum. The scarred tissue draws the uterus over to the affected side, and the thick scar tissue is readily palpated on bimanual examination.

Parametritis is usually complicated by some degree of pelvic thrombophlebitis with its risk of pyæmia, pulmonary infarction, and extension to the lower extremities to produce 'white leg'. Almost all parametritic effusions lie lateral to the uterus and vagina, where the parametrium is most plentiful, but on rare occasions an anterior parametritis develops situated between the cervix and anterior vaginal wall posteriorly and the bladder

and urethra anteriorly. The treatment of parametritis consists in rest in bed combined with the application of heat to the pelvis in the form of hot applications to the abdomen and hot vaginal douches. The treatment is similar to that described in the treatment of acute salpingo-oophoritis in Chapter II.

Cases of parametritis are rare at the present day because midwifery has become more conservative, and difficult forceps delivery in cases of dystocia has been replaced by Cæsarian section.

Tumours of the Broad Ligament and Parametrium

The commonest tumours are myomata arising in the uterus and spreading laterally, but myomata may arise independently of the uterus and lie in the utero sacral ligament.

Sarcomata arise from time to time and may present clinical physical signs similar to those of a myoma. Sometimes it is possible to remove them surgically, otherwise they are treated with X rays.

Lipomata of the broad ligament and the parametrium are not uncommon and may form very large swellings. In most cases they are enucleated without difficulty.

APPENDIX

THE nomenclature of the female sex hormones is difficult to understand and the preparations of the commercial firms are given different names although the active principles are often the same. Hormone therapy now plays an important part in gynaecology and the following list of the well known preparations may be of service to practitioners.

The Female Sex Hormones

Oestrin Until the hormone was obtained in crystalline form it was customary to standardise preparations biologically in terms of rat and mouse units. At the present time most products are put up in strength determined by the weight of the crystalline active principle they contain. The nomenclature is not easy to follow (cf p 80). Oestrin and folliculin are terms which are used by physiologists for the hormone. Estrone and estron are words used for the crystalline substance ketohydroxyoestrin. Other terms, so far as clinicians are concerned, only confuse the position. Most practitioners will prefer to use the preparations of some particular firm rather than to change the preparation from time to time.

At the present time the synthetic oestrogens such as stilboestrol, hexoestrol and dienoestrol are being used in preference to the natural oestrogens.

The following well known oestrin preparations are on the market. It should be noted that all are standardised. Products of commercial firms which do not state clearly the concentration of the hormone in the particular preparation should be passed over. The hormone must be given by injection if large concentrations are being used and most preparations contain the hormone in an oily solution which brings about slow absorption and consequent prolonged action.

I U means International Unit

I.B.U. means International Benzoate Unit

1 mgm. estrone is equivalent to 10 000 I U 1 mgm. oestradiol benzoate is equivalent to 10 000 I.B.U.

ŒSTRONE AMPOULES

Menformon	Organon
Œstroglandol	Roche
Œstrone	Ciba
Theelin	Parke Davis
Unden	Bayer

The strengths vary from 1 000 to 50 000 I U per ml

ŒSTRONE CAPSULES AND TABLETS

Menformon	Organon
Œstroglandol	Roche
Œstrin	Oxo
Ovostab	Boots
Progyonon	Schering
Theelol	Parke Davis
Unden	Bayer

ŒSTRONE PREPARATIONS

Pessaries—	
Kolpon	Organon
Menformon	Organon
Theelin	Parke Davis
Ointments—	
Menformon	Organon
Œstroglandol	Roche
Unden	Bayer

ŒSTRADIOL PREPARATIONS

Benzogynæstrol	Roussel
Dimenformon	Organon
Œstradiol	Burroughs Wellcome
Œstrin	Oxo
Œstroform	British Drug Houses
Ovocyclin	Ciba
Ovostab	Boots
Progyonon B Oleosum	Schering
Unden	Bayer

Many of these preparations are put up in ointment and pessary form

Synthetic Œstrogens Stilbœstrol is the best known and the most widely used. It is put up in ampoules for injection but it is best employed for oral administration. Stilbœstrol dipropionate is favoured in preference to stilbœstrol for certain types of case. The dose of stilbœstrol varies from 0.5 to 5 mgm. Hexestrol is an excellent substitute for stilbœstrol. Diencœstrol is more potent than stilbœstrol and is sold by Boots.

The problem of determining the relative merits of the natural and synthetic œstrogens in gynaecological therapeutics is difficult to solve. There is no doubt that the synthetic œstrogens are much more active when given orally than is the case with

the natural oestrogens. For this reason alone it is recommended that oestrin therapy should always begin with the oral administration of stilboestrol or dienoestrol by mouth. The exact dose required must be determined by clinical trial. If there is no response to treatment with the synthetic oestrogens the natural oestrogens should be given by intramuscular injection. In certain types of case response is obtained when treatment with synthetic oestrogens has failed. Clinical experience shows that 1 mgm of stilboestrol is clinically equivalent to 10,000 I B U.

The cost of the preparations differs very greatly. One firm charges 1 shilling and 6 pence for a bottle of 25 tablets each of 5 mgm stilboestrol. For 50,000 I B U one firm charges 4 shillings and 6 pence.

In addition to the preparations listed above there are many other ovarian preparations on the market, but they do not all necessarily contain the hormone oestrin. It is quite possible that they contain active substances which are of therapeutic value, but there is not the same scientific evidence to support this possibility as in the case of the oestrin preparations.

Progestin (Corpus Luteum Hormone)

The hormone was first standardised biologically in terms of rabbit units. Later the clinical unit was suggested, but since the isolation and synthesis of the active principle progesterone the International Unit has been introduced.

$$\begin{aligned} 1 \text{ mg of progesterone} &\equiv 1 \text{ International Unit} \\ &\equiv 4 \text{ Clinical Units} \\ &\equiv 1 \text{ Rabbit Unit} \end{aligned}$$

The chief sources are the synthetic product and the corpora lutea of whales killed in the Antarctic. The hormone is expensive, one firm lists a box containing 12 ampoules, each containing 5 International Units, at 58 shillings.

Lapolutin	Park & Davis
Luteostab	Boots
Lutocyclin	Ciba
Lutogyl	Roussel
Progesterone	Oxo
Progestin	Organon
Progestin	British Drug Houses
Proluton	Schering

The hormone is put up in ampoules of 1 c.c. containing from 0.5 to 10 gm progesterone.

The hormone is also used in the form anhydro hydroxy progesterone or ethisterone

Ethisterone	Boots
Ethisterone	British Drug Houses
Lutoeyclin	Ciba
Progesteral	Organon
Proluton C	Schering

It should be emphasised that the hormone has no proved pharmacological effect on the uterus unless its administration is preceded by the administration of œstrin

Anterior Pituitary like Hormones

Most gonadotropic hormones are obtained from the urine of pregnant women or pregnant animals. The extracts obtained from the urine of pregnant women are somewhat different from the anterior pituitary sex hormone. The principles, follicularising and luteinising, are not isolated for clinical work in most of the marketed preparations. The hormones are regarded by most authorities as being unstable in solution so that they are usually issued as a dry powder which is dissolved in sterile distilled water before injection. The hormones are inactive when given by mouth. All preparations are standardised in terms of rat units. Immature rats are taken and the minimum concentration necessary to produce corpora lutea and corpora hæmorrhagica is taken as the rat unit.

It has been possible to extract gonadotropic hormones from the serum of pregnant mares and to market the hormone commercially. There is experimental evidence to show that the hormone differs from that extracted from the urine of pregnant women which is nowadays referred to as chorionic gonadotrophin.

Much depends upon clinical judgment and experience in determining the therapeutic value of the gonadotropic hormones. It is well established experimentally that the hormones have very different effects in different animals. In the human subject the value of the hormones has perhaps been much exaggerated. Theoretically they should be of supreme importance in gynæcological therapeutics, but in clinical practice much cannot be hoped of them.

SERUM GONADOTROPIC HORMONE

Antostab	Boots
Gestyl	Organon
Gonadyl	Roussel
Serogan	British Drug Houses.

The preparations are given by injection and contain from 100 to 1,000 I U per c c Antostab is listed at 12 shillings and 0 pence for a box of 6 amps each containing 100 I U

CHORIONIC GONADOTROPIC HORMONE

Antuitrin S	Parke Davis
Gonan	British Drug Houses
Physostab	Boots
Pregnyl	Organon
Prolan	Bayer

One firm lists 12 ampoules, each of 500 I U at 46 shillings

Lactogenic Hormone of the Anterior Pituitary

Physolactin	Glaxo
Prolactin	Allen and Hanbury

Preparations for Vaginal Use

Trichomonad Infections

CARBARSONE (Lilly)

Trichomonad Infections and other types of Leucorrhoea

PICRAGOL (John Wyeth & Bro Ltd)

This preparation is very useful in the treatment of trichomonad infections. The material may be insufflated into the vagina or it may be given in pessary form.

PONTAMPONS (Pontampon Co)

Vaginal pessaries incorporated with protargol, glycerine and ichthyol, and glycerine of tannin

Powders, etc

BORMOL (Roberts)

For vaginal discharges. The preparation contains alum, zinc sulphate, thymol and borax

NEOLIDES (Bottu)

The tablets contain pot persulphate

SAL ANTISEPTICUS (Huxley)

The usual astringent salts are combined with thymol, etc

TERCINOL SOLUTION (Lemaître)

The solution contains carboic and salicylic acids, lactic acid and menthol

TOLAMINE SOLOIDS (Burroughes Wellcome & Co)

The made up solution is rather similar to Dakin's solution and is of service for septic vaginal discharges

PARTACON (Sandoz)

Bougies containing silver nitrate suspended with organic colloids. The bougies are advised for cervicitis

Preparations for the Treatment of Pruritus Vulvæ, etc

MARTINDALE'S ETHER SOLUBLE TAR PASTY

RESINOL OINTMENT

CASTELLANI'S PAINT

Contains basic fuchsin, phenol, resorcin and boric acid

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